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HEPTING (G. H.) & CRUIKSHANK (J. W.). **Littleleaf disease in South Carolina as determined by the forest survey.**—*J. For.*, 48, 12, pp. 837–839, 2 figs., 1 map, 1950.

Little leaf [*Phytophthora cinnamomi*] of shortleaf pine [*Pinus echinata*: *R.A.M.*, 30, p. 396] extends from central Virginia to north-eastern Mississippi [ibid., 27, p. 51]. In South Carolina it is confined to the Piedmont counties. The average life of a shortleaf pine in an advanced stage of the disease is 2½ years. A survey of South Carolina in 1947 showed that in nine counties where the disease is abundant 6·4 per cent. of the cubic-foot volume and 10·3 per cent. of the board-foot volume were in advanced stages or had recently died of the disease. Altogether in Piedmont nearly 118,000,000 board feet and 139,000 cords of wood 6 to 8 in. in diameter were in advanced stages or had recently died of little leaf. Loss, if none of this material were salvaged, was estimated at $1,751,500 spread over three years. Between 8 and 10 per cent. of the trees 10 in. or more in diameter were affected, the resultant annual loss being between 3 and 4 per cent. in the saw-timber sizes. The percentage of affected trees increased with age.

The situation in Georgia is probably similar to that in South Carolina, but losses in Alabama [loc. cit.] are greater, while in North Carolina, Virginia, Tennessee, and Mississippi they are probably much below those in South Carolina.

HENNIG (R.). **Stock- und Stammfäulen an der Douglasie.** [Butt- and trunk rot of Douglas Fir.]—*Z. PflKrankh.*, 58, 1–2, pp. 6–9, 4 figs., 1951.

In the spring of 1949 the wood of green Douglas fir trees (*Pseudotsuga taxifolia* var. *viridis*) growing in two districts of Sachsenwald, Germany, was completely rotted (1½ and 2½ m. from the base) by *Polyporus schweinitzii* [C.M.I. map No. 183; *R.A.M.*, 10, p. 70], which fructified on the butts of the felled trees. A Douglas fir stand about 8 km. distant contained about 20 to 25 per cent. of trees with heart rot caused by *Sparassis ramosa* [*S. crispa*: cf. loc. cit.]. Vigilance is advised, especially as green Douglas fir has so far been resistant to wood-destroying fungi [ibid., 29, p. 67].

MEILKE (J. L.). **Rate of deterioration of beetle-killed Engelmann Spruce.**—*J. For.*, 48, 12, pp. 882–888, 2 figs., 1950.

Studies on the rate of deterioration in *Picea engelmanni* timber killed over a period of many years by the spruce beetle *Dendroctonus engelmanni* in national forests in Colorado and Utah were conducted mostly in Utah in 1948. It was found that by far the most important factor in the 'drop-out' of the spruce was fungal infection, root rots and basal rots involving heartwood and sapwood, which were about equal in importance, accounting for the loss of 77 per cent. of the 414 fallen trees [cf. *R.A.M.*, 30, p. 205]. *Fomes pinicola* [loc. cit.] was the most common cause of basal rot. *Armillaria mellea* and *F. pini* were both very common, the former

causing basal and root rot of standing trees, the latter present in trees before they died and causing some windbreak and basal rot of standing trees and decay of fallen ones. Also present were *F. nigrolimitatus* [loc. cit.] (common, causing decay of fallen trees and basal rot of standing trees), *Lenzites sepiaria* (fairly common, only on fallen trees), *Polyporus albo-luteus* [ibid., 22, p. 187] (very common, only on fallen trees), *P. circinatus* (fairly common, causing root and basal rot in many trees before they were killed), *P. leucospongia* [ibid., 9, p. 628] (fairly common on decorticated trees down for some time), *P. ursinus* [cf. ibid., 18, p. 645] (common, on fallen trees only), *P.* [*Polystictus*] *abietinus* (fairly common), *Poria* (?) sp. (occasional), *Stereum abietinum* (fairly common), *Trametes serialis* [ibid., 29, p. 3] (occasional), and *T. variiformis* [cf. ibid., 22, p. 187; 28, p. 441] (common). Blue stain did not appear to be a serious defect; almost all, if not all, appeared to be caused by an unidentified fungus carried by the beetles. The moisture content of standing killed trees that have been dead for three years or more is so low (under 22 per cent.) that decay fungi are unable to develop. Such trees were mostly perfectly sound. In view of all the data it appears likely that a very high percentage of the beetle-killed spruce in Colorado will remain standing and sound for at least 20 years.

Miller (P. W.). **Nut diseases in Oregon in 1950.**—*Plant Dis. Reptr*, 35, 3, p. 145, 1951. [Multilithed.]

It is estimated that during 1950 not more than 4 per cent. of the Oregon walnut crop was destroyed by blight (*Xanthomonas juglandis*) [*R.A.M.*, 30, p. 252], this being one of the smallest crop losses from the disease recorded for the State. *Armillaria mellea* [ibid., 28, p. 94] caused the death of seedling Persian and a few Franquette walnuts grafted on *Juglans hindsii* rootstock, which has hitherto been regarded as highly resistant. Non-parasitic leaf scorch [loc. cit.] was widely distributed, being extremely prevalent in soils deficient in boron. Girdle or black line [ibid., 28, p. 95] caused the death of more grafted Franquette trees than any other disease. In ten representative, widely scattered, affected Franquette orchards, 80 per cent. of 518 declining trees were suffering from the disease. Almost all districts were attacked and all the affected trees were grafted on *J. hindsii* or its hybrids.

Filberts [*Corylus avellana* and *C. maxima*] were widely attacked by bacterial blight (*X. corylina*) [ibid., 28, p. 649] which caused the death of many trees one to three years old.

Hotson (H. H.) & Cutter (V. M.). **The isolation and culture of Gymnosporangium juniperi-virginianae Schw. upon artificial media.**—*Proc. nat. Acad. Sci., Wash.*, 37, 7, pp. 400–403, 1951.

In studies in the Department of Plant Science, Yale University, the inner parenchyma tissue of teleutospore galls of *Gymnosporangium juniperi-virginianae* on *Juniperus virginiana* [*R.A.M.*, 29, p. 68] was cultured successfully in modified Gautheret's nutrient solution No. 4 plus 500 p.p.m. ascorbic acid and 1 per cent. yeast extract in sealed test tubes. The dextrose concentration was raised to 3 per cent. After three to four months the intercellular mycelium had invaded the new cellular growth; after five months typical telial horns with viable teleutospores were produced on the original tissues. In some cases a white, fluffy, binucleate aerial mycelium developed around the base of the horns. In one four-month-old culture a mycelial fungus grew out from the callus tissue into the medium. It continued to grow when transferred to a variety of synthetic and natural media, and during several months' culturing, there developed at scattered points over the colonies prosenchymatic areas, reminiscent of the roestelial initials produced by *G. juniperi-virginianae* on the leaves of *Crataegus*. Ultimately chains of atypical,

abortive, thick-walled, orange-brown spores were produced within or upon these areas. Of twelve callus cultures of *C. coccinea* inoculated in July, 1950, with bits of the cultured mycelium, three developed typical roestelia of *G. juniperi-virginianae* in September, producing aecidiospores and peridial cells as in natural infections. By October the mycelium had invaded the tissues of all calluses but one, and was indistinguishable from the intercellular mycelium of *Gymnosporangium* in field collections of *Crataegus*. Uninoculated calluses from the same source contained no intercellular mycelium.

Harrow (K. M.). **Leachability of some water-soluble wood preservatives.**—*N.Z. J. Sci. Tech.*, Sect. B, 32, 6, pp. 33–40, 1951.

At the Plant Diseases Division, Department of Scientific and Industrial Research, Auckland, chemical analyses were made to determine the amount of leaching from rimu [*Dacrydium cupressinum*], tawa [*Beilschmiedia tawa*], and *Pinus radiata* blocks impregnated with 0·58 per cent. tanalith, 0·4 and 0·8 per cent. boric acid, and 1·44 per cent. zinc chloride [*R.A.M.*, 30, p. 398] and exposed to the weather. Losses of boric acid and tanalith in six months varied from 30 to 60 per cent., while zinc chloride loss was between 16 and 24 per cent. Leaching occurred chiefly from the outer wood layer. In order to minimize these losses cover boards should be used when stacks of impregnated timber are held in the open for more than a few weeks. Where exposure for long periods is unavoidable, the loading of preservative should be increased to allow for possible loss.

Rudakov (K. I.), Staruigina (Mme. L. P.), & Shishelova (Mme. N. A.). Мягкая гниль овощных. [Soft rot of vegetables.] Докл. Акад. Сельскохо. Наук Ленина [*Rep. Lenin Acad. agric. Sci.*,], *1950*, 10, pp. 25–28, 1950.

In the cabbage-growing regions of central U.S.S.R. the plants and especially the seeds are attacked by soft rot due to *Erwinia carotovora* [*R.A.M.*, 28, p. 555], which is difficult to control, and to *Bac*[*illus*] *mesentericus*, *B. subtilis*, and especially *B. polymyxa* [cf. ibid., 29, p. 85]. The latter group causes rot only at temperatures over 35° C. and of the aerial parts only; they are infected from the soil by the contact of the lower leaves or by insects. The most effective measures for controlling rot by the latter group are the lowering of the temperature of the soil and preventing its contact with the lower leaves as well as avoiding unfavourable conditions of nutrition, removing the lower leaves of year-old cabbage, and the destruction of cabbage insects.

Bockstahler (H. W.), Hogaboam (G. J.), & Schneider (C. L.). **Further studies on the inheritance of black root resistance in Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol.*, *1950*, pp. 104–107, [? 1951].

Field tests were carried out in Michigan and Minnesota in 1949 wherein strains of sugar beets, classified as either susceptible or resistant to black root, and hybrids between them were planted in soil naturally infested with the black root organism *Aphanomyces cochlioides* [*R.A.M.*, 28, p. 611; 29, p. 81]. The difference in yield between hybrids and parents of the resistant × susceptible crosses was considerable. Such hybrids usually outyielded their parents, particularly the susceptible one. The conclusion already reached in previous work [ibid., 27, p. 3] that resistance to black root is transmitted to the hybrid as a dominant is confirmed in these tests.

Coons (G. H.), Kotila (J. E.), & Stewart (D.). **Savoy, a virus disease of Beet transmitted by Piesma cinerea.**—*Proc. Amer. Soc. Sug. Beet Technol.*, *1950*, pp. 500–501, 1 fig., [? 1951].

A description is given of the Savoy virus disease of sugar beets in the United States and its transmission by *Piesma cinerea* [*R.A.M.*, 16, p. 510; 21, p. 399].

The disease has since been found in Maryland, Texas, and Montana. Its economic significance has proved to be relatively small. Graft transfers of the virus were successful if the diseased scion was left in place for seven days.

GIDDINGS (N. J.). **Combination and separation of curly-top virus strains.**—*Proc. Amer. Soc. Sug. Beet Technol., 1950*, pp. 502–507, [? 1951].

This information on experiments with beet curly top virus strains in California has already been noted from another source [*R.A.M.*, 29, p. 548].

GASKILL (J. O.). **Possibilities for improving storage-rot resistance of Sugar Beets through breeding.**—*Proc. Amer. Soc. Sug. Beet Technol., 1950*, pp. 665–669, 2 figs., [? 1951].

A description is given of storage tests on 26 strains of sugar beet, one of mangold, and two of garden beet carried out at Fort Collins, Colorado, with a view to improving the keeping quality of sugar beets [*R.A.M.*, 29, p. 598 and next abstracts] through selection and breeding for resistance to [unspecified] storage-rot. In 1949 rotted tissue was used to inoculate the healthy beets. In 1950 a virulent culture of *Phoma betae* [loc. cit.] was used. Garden beets proved very resistant to rotting. The results of these experiments seem to justify the tentative conclusion that such breeding should be advantageous.

GASKILL (J. O.). **Effects of wilting, drought, and temperature upon rotting of Sugar Beets during storage.**—*Proc. Amer. Soc. Sug. Beet Technol., 1950*, pp. 653–659, 2 figs., [? 1951].

A description is given of storage experiments carried out over two years at Colorado Experiment Station, Fort Collins, on [unspecified] rotting of sugar beets [see preceding and next abstracts]. The results showed conclusively the disastrous effects of field wilting upon keeping quality. Percentage rot, relatively low in check samples (washed roots dried ½ to 1 hour outdoors), increased significantly (7 to 23 times) for one, two, and four days' drying. After 3 to 4½ months' storage samples taken from 1948 plots in which moderate drought conditions had existed during the season had much greater average percentage rot than those taken from well-watered plots. Rot percentages for two groups of samples stored at 45° F. were 3·65 and 0·56, while for those stored at 65° they were seven and 15 times as great, respectively. Temperature, therefore, is an important factor in rotting of sugar beets during storage.

GASKILL (J. O.). **Progress report on the effects of nutrition, bruising, and washing upon rotting of stored Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1950*, pp. 680–685, 1 fig., [? 1951].

At the Colorado A & M Experiment Station sugar beets were stored for 3 and 4 to 4½ months at temperatures of 65° and 45° F., respectively [cf. preceding abstract]. At 45° those grown in replicated nitrogen-fertilized plots in a field moderately deficient in nitrogen developed less [unspecified] storage rot than those receiving no nitrogen. There was a higher percentage of rot on injured roots at both temperatures, particularly at 65°.

STOLL (K.). **Resistenzprüfungen an Leguminosen gegenüber dem Fusskrankheits-erreger Ascochyta pinodella Jones.** [Resistance tests on Leguminosae against the agent of foot rot, *Ascochyta pinodella* Jones.]—*Z. PflZücht.*, 29, 2, pp. 175–192, 6 figs., 1 graph, 1950.

Greenhouse and field experiments were carried out in 1948 and 1949 at the Aschersleben branch of the Biological Institute, Germany, to test various pea varieties for resistance to *Ascochyta pinodella* [*R.A.M.*, 30, p. 299]. Using

Wehlburg's infection method (soaking the seeds for 24 hours in a spore suspension before planting) [ibid., 12, p. 483], the plants from colourless seed (*Pisum sativum*) developed mostly severe symptoms, while those from coloured seed (*P. arvense*) remained almost free from infection owing to a structurally conditioned 'false' resistance. Of the coloured, Graue Buntblühende, Schweizer Riesen, and Lucienhofer winter pea recorded the highest emergence percentages and yields. Of the colourless-seeded varieties, Zeiners Kurz, Gut, and Onsa Schal were the most satisfactory. Other varieties with high emergence and yields included Salzmünder Edelperle, Salzmünder Frühe, Peragis field pea, and Friedeburger Viktoria. The results suggest that a plasmatically conditioned resistance for the foot rot stage of the disease probably does not exist.

Burke (D. W.) & Starr (G. H.). **Studies on Bean root rot in northern Wyoming.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 2, pp. 58–59, 1950.

Root rot (*Fusarium* spp.) [cf. *R.A.M.*, 25, p. 332; 28, p. 471; 29, pp. 452, 599; 30, p. 92] is rapidly becoming one of the major bean [*Phaseolus vulgaris*] diseases in northern Wyoming. Of 23 varieties tested at Big Horn Research Station, Powell, in field plots and in the greenhouse, the Great Northern varieties, as a group, were the most susceptible, followed by Red Mexican, Pinto, and snap bean varieties. Cherokee Wax was most resistant, followed by Red Valentine and Asgrow Black Valentine. Hundreds of collections from the Cheyenne Horticultural Field Station are being tested, the scarlet runner bean [*P. multiflorus*] showing the highest resistance. All varieties are adversely affected by deep planting in heavily infested soils, especially in cool, wet conditions.

Hildreth (R. C.) & Starr (G. H.). **Antibiotics alone and in combination for the control of bacterial blight of Beans.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 2, p. 58, 1950.

In further work at the University of Wyoming on the control of bean [*Phaseolus vulgaris*] bacterial blight [*Pseudomonas medicaginis* f.sp. *phaseolicola*] by antibiotics [*R.A.M.*, 29, p. 600] the following percentages of infection were obtained: dry control 33·4, wet control (soaked 15 minutes) 44·6, chloromycetin [ibid., 29, p. 146] 6·3, streptomycin sulphate 1·9, streptomycin hydrochloride 3·6, neomycin 1·6, bacitracin [ibid., 29, p. 271] 10·6, subtilin [ibid., 26, p. 447] 14·7, and penicillin 18·7. The best control appeared to be given by a combination of penicillin and neomycin, with an average of 1·5 per cent. infection.

Thomas (W. D.). **Seed-borne red node of Pinto Beans.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 2, p. 59, 1950.

A total of 6,687 seeds from 136 lots of Pinto beans [*Phaseolus vulgaris*] selected from field plots in Colorado affected by red node [*R.A.M.*, 30, p. 256 and next abstract] were tested in the greenhouse for evidence of seed-borne transmission. In five tests infection averaged 6·2 per cent. A maximum infection of 23·6 per cent. was obtained in one lot of 195 seeds, though in most lots infection averaged under 5 per cent.

Graham (R. W.). **Preliminary studies of the effects of temperature and moisture on red node symptoms of Beans.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 2, p. 59, 1950.

In studies at the A and M College, Colorado, potted Pinto beans [*Phaseolus vulgaris*] were inoculated by the carborundum method with red node [virus: see preceding abstract]. Three temperatures (80°, 75°, and 65° F.) and three moisture conditions (wet, medium, and dry) were used in all combinations. Symptoms

appeared in four days at 80°, six at 75°, and ten at 65°, but failed to show variations under the different moisture conditions.

Skiles (R. L.). **The fungi causing purple blotch of Onions.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 2, pp. 59–60, 1950.

The foliage of Yellow and White Sweet Spanish onions in Colorado is often attacked by fungi which cause the formation of purple, brown, and mixed lesions. Isolations from the infected areas gave *Alternaria porri* [*R.A.M.*, 25, p. 149], *A. tenuis* [ibid., 30, p. 589], and *A. tenuissima*. Bulb inoculations showed that *A. porri* is highly parasitic on two strains of Yellow Sweet Spanish, while the other two species varied from non- to slightly parasitic. The bulb rots caused by *A. tenuis* and *A. tenuissima* were typical of those commonly attributed to *A. porri*. When the fungi were inoculated on to the foliage of Colorado No. 6 strain of Yellow Sweet Spanish grown in the field and of Colorado No. 6, Mountain Danvers, the Brigham variety of Southport Yellow Globe, Early Yellow Globe, and Yellow Globe Danvers in the glasshouse all three were found capable of primary and secondary parasitism and each produced both brown and purple lesions. *A. porri* was the most pathogenic on mechanically injured and uninjured leaves.

Kunkel (L. O.). **Identification of bolting disease of Carrots.**—Abs. in *Phytopathology*, 41, 1, p. 22, 1951.

The roots of one lot of carrots from Washington that had shown foliar bronzing and discoloration were found on examination in 1945 to be infected by aster yellows [virus: *R.A.M.*, 29, p. 193]. Another package contained carrots that had bolted, and this disease was conveyed to healthy carrot plants by *Cuscuta campestris*. In 1947 tomato big bud virus from California [ibid., 27, p. 341] was transmitted to healthy carrots, on which it induced bolting and other symptoms similar to the carrot disease. Tomatoes infected by juice from the Washington plants developed a much milder form of big bud than that occurring in California, and it is concluded that different viruses are responsible for the two diseases.

Vegetable growers' field day, Scoresby Research Station.—*J. Dep. Agric. Vict.*, 49, 6, pp. 259–264, 4 figs., 1951.

Speaking at a field day for growers held at Scoresby Horticultural Research Station, Victoria, R. O. Kefford stated that Arbuckle's strain of the W[est] A[ustralian] Intermediate carrot variety and Purvis's strain of James Intermediate are tolerant of carrot virus [*R.A.M.*, 25, p. 23; cf. preceding abstract] and can be grown out of season. Victorian Virus Tolerant, a selection from James Intermediate, has given the most consistent results, being free from virus; Yates Topweight shows a good degree of tolerance, while Red-Cored Chantenay, although not virus-tolerant, may be used successfully for November to January plantings. The Great Lakes lettuce variety is increasing in popularity as it is resistant to tipburn and slime [cf. ibid., 24, p. 39; 27, p. 170; 29, p. 498]; Pennlake is also resistant.

Tiffany (Lois H.). **The anthracnose complex on Soybeans.**—*Iowa St. Coll. J. Sci.*, 25, 2, pp. 371–372, 1951.

In this summary of a Doctoral thesis it is reported that *Colletotrichum truncatum*, *C. destructivum*, and *Glomerella glycines* [*R.A.M.*, 29, p. 82] commonly cause anthracnose of soy-beans in Iowa. Seed-borne inoculum of *C. truncatum* may bring about the symptomless establishment of internal mycelium as well as pre-emergence killing and seedling blight. Cross-inoculation studies were made with these and other anthracnose fungi occurring on common legumes. Red clover was attacked by *C. destructivum*, *C. trifolii* [ibid., 28, p. 116], *C. truncatum*, and *C. graminicola*. Soy-bean, lucerne, and sweet clover were susceptible to the same four

species. *C. villosum* [ibid., 30, p. 232] and *C. truncatum* were capable of attacking vetch. Garden beans [*Phaseolus vulgaris*] were attacked only by *C. lindemuthianum* [ibid., 29, pp. 499, 600]. The conidial state of *G. glycines* is not *C. glycines*, but a straight-spored form similar to *C. destructivum*.

NEDELCHEV (N.) & RADUCHEV (S.). Опит с третиране на лозите против перопноспората. [Experiments with treatments against Vine mildew.]—*Annu. Fac. Agron. Dimitrov Acad.*, 27 (*1948–1949*), pp. 29–34, 1949. [Russian and French summaries.]

Further experiments are reported on the use of Bordeaux mixture of several formulae and two imported fungicides for the control of vine [downy] mildew [*Plasmopara viticola*: *R.A.M.*, 27, p. 62] at Saranovo, Bulgaria, in 1948, a year favourable to the development of the disease. Dattier Beyrouth vines were given eight treatments. The results show that 1 per cent. fuclasin PF 89 Schering mixture without any copper was as effective (33·8 per cent. leaf spots and 7·46 mildewed grapes) as 0·3 per cent. Bordeaux mixture (34·7 and 7·42) and is sufficient to control *P. viticola*. It is believed that when its concentration is increased by 2 to 3 per cent. it will be equally effective with 1 per cent. Bordeaux mixture (6·5 and 1·71). Copper Sandoz at 0·3 per cent. (150 gm. copper per hl.) was slightly superior (9 and 6·37) to Bordeaux of the same content (15·6 and 5·76). None was equivalent to 1·5 per cent. Bordeaux (2·1 and 0·37).

Stations fédérales d'essais viticoles, arboricoles et de chimie agricole, à Lausanne et à Pully. Rapport d'activité 1949. [Report for 1949 on the work of the Federal Viticultural, Arboricultural, and Agricultural Chemistry Stations at Lausanne and Pully.]—*Annu. agric. Suisse*, 51, 8, pp. 729–861, 13 graphs, 1950.

In the section of this report [cf. *R.A.M.*, 29, p. 455] dealing with physiology (pp. 760–783), M. STAEHELIN and W. WURGLER comment briefly on the progress of investigations on the dying-off of cherries, accompanied by symptoms reminiscent of virus infection, in the canton of Ticino [ibid., 30, p. 50]. From one orchard, apparently the most severely affected, sap was collected in 1948 and inoculated into 21 trees, of which seven made poor growth and developed symptoms resembling those of the suspected individuals.

In spraying experiments for the joint control of codling moth [*Cydia pomonella*] and scab [*Venturia inaequalis*] somewhat more damage, in the form of leaf scorch followed by defoliation and fruit drop, was caused by lime-sulphur at 32° Baumé than at 22°. The toxicity of lime-sulphur, and to a lesser extent that of wettable sulphur, was aggravated by the admixture of lead arsenate [ibid., 30, p. 327]. Wettable sulphur was definitely less detrimental to the trees than lime-sulphur in these experiments.

In trials on Chasselas vines to determine the effect of the quality of the lime component in Bordeaux mixture, used against downy mildew (*Plasmopara viticola*), the least damage was caused by a milk of lime prepared with freshly dissolved lime. All the commercial brands of slaked lime used in Bordeaux mixture caused more or less severe scorch. No correlation was apparent between the degree of fineness of the lime or its degree of conversion into carbonate and the intensity of the injury. Little damage is to be expected by spray pressures within the range 5 and 20 atmospheres, and even at 20 and 30 the effects of Bordeaux mixture are not serious.

C. TERRIER records in the section of mycology (pp. 799–803) the locally unusual development of perithecia of *Uncinula necator* on vine as a sequel to the hot, dry autumn weather.

In one test, following a fall of hail on 16th July, vines were effectively protected against *Coniella* [*Coniothyrium*] *diplodiella* by products with neutral oxyquinoline

sulphate base [ibid., 27, p. 376], but in another, on 24th August, the results were much less satisfactory. Laboratory experiments have shown that the compound reacts with the copper deposit on the vines after treatments for downy mildew and is thereby deprived of activity against *C. diplodiella* [cf. ibid., 30, p. 177].

Further experiments were undertaken in Ticino with a view to the control of peach mildew (*Sphaerotheca pannosa* [var. *persicae*]). In one series of four applications, using various wettable sulphurs and lime-sulphur with the addition of iron sulphate and a wetter in equal parts, the degree of protection afforded to the fruits was mediocre, while on the leaves it was utterly inadequate. Potassium permanganate plus hydrated lime arrested infection on the fruits and temporarily checked it on the foliage. A 0·5 per cent. solution of tumex [ibid., 27, p. 376] controlled the disease but caused severe leaf scorch. Used as a dust, tumex gave optimum control of mildew without damage to the host.

Apple mildew (*Podosphaera leucotricha*) continues to spread, and none of the methods in current use for its control sufficiently restrains its development. It is not generally recognized that the spores of the fungus are not dependent on showers of rain for their liberation and germination, but disperse of their own accord from their site of origin and germinate in the presence of moderate air humidity. Thus, contamination and primary infection may occur at practically any time, irrespective of precipitation. The shoots should therefore be treated at five- to eight-day intervals from the inception of growth until flowering. In the late autumn perithecia developed in profusion on the infected branches, favoured by a spell of hot, dry weather [ibid., 30, p. 276].

Plantesygdomme i Danmark 1948. Årsoversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark 1948. Annual survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, 54, 1, pp. 1–61, 2 graphs, 1950. [English summary.]

Among the many items of interest in the sections of this report [cf. *R.A.M.*, 29, p. 248] contributed by H. R. Hansen and Anna Weber the following may be mentioned. Effective control of manganese deficiency, very prevalent in spring cereals and occasionally causing heavy damage to winter crops, was secured and yields increased by spraying with 2 per cent. manganese sulphate.

Septoria tritici [ibid., 25, p. 155] was fairly common in winter wheat samples received during April and May and is believed to have caused considerable foliar decay.

Internal rust spot of potato tubers [ibid., 13, p. 650, *et passim*] was troublesome in places. Potato leaf roll virus [ibid., 25, pp. 135, 179] was widespread and severe, heavily reducing yields where seed certification was not practised. Crinkle [potato virus X+potato virus A] and severe mosaic [potato virus Y] were widely distributed and locally virulent. Wart disease (*Synchytrium endobioticum*) [ibid., 29, p. 248] was detected in nine new municipalities.

Beet yellows virus [loc. cit.] was fairly common in seed beets, especially in eastern Jutland and in Funen. In 13 trials, in which heavily infected plants were grown beside healthy ones, the latter outyielded the former by 80 to 1,650 kg. per ha. [cf. ibid., 29, p. 598]. The perfect state (*Helicobasidium purpureum*) of the violet root rot organism was observed for the first time in Denmark on fodder beets submitted for examination at the end of October.

Seed swedes sustained heavy damage from [turnip] mosaic virus [ibid., 24, p. 438], necessitating in some cases the ploughing-up of the field and re-sowing with other crops.

Blossom wilt (*Sclerotinia laxa*) was frequently observed in a destructive form on cherries [ibid., 5, p. 559], while Boiken and other apple varieties were attacked by *S. laxa* f. *mali* [ibid., 16, p. 63].

Peach leaf curl (*Taphrina deformans*) [ibid., 5, p. 560] was very widespread, and more care should be taken in its elimination from nurseries, a frequent source of dissemination of the fungus. Not one of the raspberry plantings inspected was altogether free from virus diseases.

Currant reversion virus, though often very destructive on black currants [ibid., 9, p. 752], is apt to be overlooked. It is hoped that the present scheme of inspection and certification for disease-free stocks will help to produce more healthy plants for the market.

Tomato mosaic (*Nicotiana* virus 1) [tobacco mosaic virus] was much in evidence. After some warm days in April, the leaves of many plants acquired a narrow appearance suggestive of fern leaf [cucumber mosaic virus: ibid., 15, p. 614], but resumed their normal aspect with the advent of cooler conditions and the application of nitrogen to the soil.

Mosaic-like symptoms, including stunting of the plants, shortening and distortion of the shoots, and foliar puckering and fluting, have been observed for several years in *Hydrangea* culture during the forcing period, and the agency of a virus is suspected [cf. ibid., 13, p. 9].

Report of the Head of the Division of Mycology and Plant Pathology.—*Sci. Rep. Indian agric. Res. Inst., New Delhi, 1947–1948*, pp. 145–160. [? 1950. Received April, 1951.]

Much of the information in this report [cf. *R.A.M.*, 28, p. 160] has already been noticed from other sources. The results of work in progress on a number of important diseases are summarized, including loose smut (*Ustilago tritici*), Karnal bunt (*Neovossia indica*), and black rust (*Puccinia graminis*) of wheat [see below, p. 604], wilts of pigeon pea (*Fusarium udum*) and *Cicer arietinum* (*F. orthoceras* [var. *ciceri*]), potato blight (*Phytophthora infestans*), flax rust (*Melampsora lini*), and several viruses.

Of the 97 sugar-cane varieties, comprising 4,700 plants, tested by inoculation for their reaction to red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*: ibid., 29, p. 477; 30, p. 510] with an extremely virulent isolate (No. 244) of the fungus, only Co. 214, S.S. Burma, S.S. Glagah, Katha, Sclerostachya, and S.S. Coimbatore proved highly resistant. Of 93 varieties inoculated with *Ustilago scitaminea*, 29 showing less than 15 per cent. infection, e.g., Co. 356, 617, and 630, Uba, S.S. Burma, S.S. Glagah, Java, and Sclerostachya, may be regarded as resistant.

Among the virus disease under investigation 'smalling' of *Crotalaria juncea* is characterized by drastic stunting of the aerial organs, accompanied by excessive branching and reduction in the length of the internodes and petioles, leaf mottling, and usually by sterility. The virus is sap-transmissible and withstands ten minutes' exposure to a temperature of 85° C. but not 90°. It retains its activity after 41 to 50 days' storage at 12° to 15° and tolerates a dilution of 1 in 25,000 to 1 in 30,000 in crude sap.

Yellow mottling and vein-clearing are prominent symptoms of the yellow mosaic of lettuce. Old diseased leaves are thick, leathery, and often chlorotic along the margins. The virus is sap-transmissible and seed-borne. It remains infective after ten minutes' exposure to 86°, but not to 87°, and withstands dilution 1 in 60,000 to 1 in 70,000 and 60 (but not 64) days' storage at 15° to 25°.

Ciferri (R.). **Hollow heart of Cacao beans.**—*Phytopathology*, 41, 7, p. 656, 1951.

A peculiar malformation of fresh cacao beans in Venezuela is characterized by a blackish-brown discoloration of the central portion, containing a small, lenticular cavity completely enclosed by the surrounding healthy flesh of the cotyledons [*R.A.M.*, 29, p. 356]. The affected tissues are uniformly sterile. The defect, known

as 'hollow heart', occurs exclusively in 'criollo' [indigenous] subspecies or high-quality hybrids combining the characteristics of native and Venezuelan 'forastero' [foreign], which constitute the best market-type commercial cacao. The presence of 'hollow heart', therefore, serves as an indication of the degree of native stock in superior strains of Venezuelan foreign.

All pods from a single tree contain abnormal beans, which appear to be more numerous, however, in those developing during the dry season or on old or unhealthy trees. Beans with 'hollow heart' tend to be localized in the distal portion of the pod. The disorder is recognizable only during the final stage of ripening. It originates as a narrow, short, brown stripe. Affected seeds do not give rise to seedlings. 'Hollow heart' is of no economic importance, the percentage of beans involved seldom reaching 10 to 15 per cent. or one to five per pod.

JØRSTAD (I.). **The graminicolous rust fungi of Norway.**—*Skr. norske VidenskAkad.*, I, *1950*, 3, 92 pp., 1 map, 1950 (issued 1951).

This valuable monograph is based on an examination of all the accessible graminicolous rust material collected in Norway, very largely by the writer between 1917 and 1949, and for the most part preserved in the Botanical Museum of the University, Oslo. The rusts are treated under 18 specific names, with the addition of two varieties of *Puccinia coronata*, var. *gibberosa* (Lagh.) Jørst. (*Avh. norske VidenskAkad.*, I, *1948*, 2, p. 9, 1949) on *Festuca altissima*, and var. *melicae* (ibid., p. 7) on *Melica nutans*. Under *P. rubigo-vera*, however, 11 species names are included, among them *P. triticina*. The International Rules of Botanical Nomenclature [*R.A.M.*, 16, p. 482; 30, p. 381] are now considered to require the use of *P. brachypodii* instead of *P. baryi*, while *P. poae-sudeticae* [ibid., 26, p. 493] should be replaced by *P. poae-nemoralis*. *P. glumarum* is retained, though the valid name now seems to be *P. striiformis* Westend.

The geographical distribution of the species is tabulated and summarized with special reference to the northernmost regions, their southern habitats being better known. *P. glumarum* is usually of minor importance on wheat, but heavy outbreaks occur from time to time, mostly on the foliage of winter varieties. It is common, but seldom severe, on barley, and very scarce on rye. Other hosts of the yellow rust include *Agropyron caninum*, *A. repens*, and *Dactylis glomerata* (possibly a newly introduced physiologic race, which was unknown in the country before 1933). *P. graminis* is fairly prevalent on oats and rye in the south-eastern and eastern lowlands and on barley in the Oslofjord area. It occurs sparsely on wheat along the Skager Rack coast and in the south-eastern and eastern lowlands; heavy damage, however, may occasionally be caused. The aecidia of the rust are ubiquitous on both wild and cultivated barberries, and a very few have been detected in the Oslofjord region on *Berberis aggregata*, *Mahonia aquifolium* (berries only), and *B. wilsonae*. The existing ban on planting applies solely to common barberry. Of the numerous diplont hosts of *P. graminis* the most commonly infested is *A. repens*. Independent of host alternation are the races harboured by the universally prevalent *Deschampsia caespitosa* and *Anthoxanthum odoratum*, *Briza media* in coastal areas northwards to Trøndelag, and the extensively cultivated *Phleum pratense*. *Puccinia graminis* has never been collected in the mountains proper. Of the compulsorily heteroecious races, that on *Agrostis tenuis* has been found at an altitude of 725 m. above sea-level, but the others are known to occur only at or below 400 m.

P. hordei is of little economic importance on barley in Norway, the range of the rust being definitely southern and the crop commonly cultivated in the north. Its aecidial hosts, *Ornithogalum* spp., are uncommon, though *O. umbellatum* [ibid., 29, p. 151] is cultivated as an ornamental on a small scale. *P. hordei*, therefore, is independent of host alternation. *P. poarum* is mostly restricted to *Poa pratensis*

and other *P.* spp. growing in close proximity to aecidia-bearing *Tussilago farfara* [ibid., 25, p. 389], which extends into the subalpine region (up to 900 m.).

In southern Norway, where *Puccinia dispersa* predominates, rye is cultivated exclusively as a winter crop. The aecidial stage on *Anchusa* is to be found, but is superfluous for the maintenance of the rust.

A key to the species and a three-page bibliography are appended.

Machacek (J. E.), Cherewick (W. J.), Mead (H. W.), & Broadfoot (W. C.). **A study of some seed-borne diseases of cereals in Canada. II. Kinds of fungi and prevalence of disease in cereal seed.**—*Sci. Agric.*, 31, 5, pp. 193–206, 1951.

In further studies at the Dominion Laboratory of Plant Pathology, Winnipeg [cf. *R.A.M.*, 30, p. 145], of 8,428 cereal seed samples tested for various defects over a seven-year period (1939 to 1945), 6,204 surface-sterilized samples were passed through an agar plate test to determine the amount and kinds of micro-organisms within the seed [cf. ibid., 30, p. 515]. Isolations yielded 43 different genera (102 species). Among the fungi, *Alternaria* [loc. cit.] was the most common. The isolates, all of the *A. tenuis* group, were weakly pathogenic to seedlings. *Helminthosporium* (comparatively rare) was the most common of the pathogens; the mean percentages of wheat, oat, and barley seeds infected with *H. sativum* were 2·45, 1·41, and 5·64, respectively. *Fusarium* spp. were abundant in oats (3·28) and barley (1·98), but less so in wheat. *F. poae*, *F. equiseti*, and *F. scirpi-acuminatum* (determined by W. L. Gordon) were predominant. Seed from eastern Canada was, on the whole, more frequently infected by pathogenic fungi than that from western Canada.

In the commercial grade of seed the proportion of defective samples was larger than in any of the higher grades, mainly because of a higher degree of smut contamination (*Tilletia foetida* and *T. caries* on wheat, *Ustilago avenae* and *U. kolleri* on oats, and *U. nigra* and *U. hordei* on barley), especially in oats and barley.

Hoffmann (W.). **Erfolge und gegenwärtiger Stand der Hallenser Arbeiten zur Kombinationszüchtung bei Getreide.** [Successes and present position of the work at Halle on combined cereal breeding.]—*Z. PflZücht.*, 29, 3, pp. 318–345, 1951.

Much of the information in this review of progress in breeding cereals combining disease resistance with high agronomic qualities at the Plant Breeding Institute, Halle, Germany, has already been noticed [*R.A.M.*, 24, p. 361; 25, p. 494, *et passim*]. Of the newer promising winter wheat lines resistant to both yellow and brown rust (*Puccinia glumarum* and *P. triticina*), developed from 3301/38 and 3312/38 [ibid., 24, p. 359], the following may be mentioned: 3384/47, 5176/48, 2647/48, 2655/48, and 467/44 (Heine IV × Koga).

Breeding winter barley resistant to powdery mildew (*Erysiphe graminis hordei*) [ibid., 25, p. 31] is of primary importance, and the selections 391/45 and 392/45 which derive their resistance from Ragusa [loc. cit.] are very satisfactory. They are hardy and outyielded Mahndorfer by 12·4 per cent. in the 1948–50 tests. The selections 545/45 and 776/46 proved fully resistant to loose smut (*Ustilago nuda*) [ibid., 29, p. 409], deriving their resistance from the Japanese variety Tokuji, while 894/48 (resistance from Japanese Bozu) combines resistance to loose smut and leaf stripe (*Helminthosporium gramineum*) [ibid., 28, p. 388]. Selection 876/48, a derivative from a cross between IFH 2206–10/41 and a hardy line, was resistant to all three diseases in the field, but its resistance to the last two requires further testing. The summer barleys, 5108/44 and 5131/44, progenies of a cross with 4849/39, are resistant to powdery mildew, are early maturing and high-yielding. M.892/44 (4583/36 × Weihenstephaner II) is a smooth-awned, mildew-resistant,

high-yielding selection. A promising selection, 5834/49, combining resistance to powdery mildew (from Weihenstephaner II) and loose smut (Nakano Vase), exceeded Haisa in yields, while 632/49, a multiple hybrid, proved resistant to powdery mildew, loose smut, and leaf stripe, and equalled Haisa in yield. The smooth grained IH 5389/46 is resistant to powdery mildew and leaf stripe, and IFH 6351/49 combines leaf stripe and loose smut resistance. Both are progeny of Weihenstephaner II and Nepal.

The more recent oat selections resistant to loose smut (*Ustilago avenae*) [ibid., 24, p. 361] are from Mesdag and Red Rust-proof and include I 66/46 and I 49/46.

Åkerman (Å.). **Fünfzig Jahre Weizenzüchtung in Schweden.** [Fifty years of Wheat breeding in Sweden.]—*Z. PflZücht.*, 29, 3, pp. 346–365, 3 figs., 1951.

This is a comprehensive report on the methods and achievements in breeding high quality wheats during the last 50 years at Svalöf, Sweden. The rusts are not a great problem, and only yellow rust [*Puccinia glumarum*: *R.A.M.*, 17, p. 232] requires consideration in the breeding programme. The varietal reaction to this rust is tested under natural conditions in the field, and most of the new selections are little affected. In 1948 and 1949 at Schonen, wheat suffered serious damage from *Cercosporella herpotrichoides* [ibid., 28, p. 168]. The most resistant variety was Skandia III, while its hybrids, Hansa, Eroica, and Borg, also showed some resistance.

Mildew (*Erysiphe graminis*) [ibid., 29, pp. 150, 249] has been serious in recent years on summer wheat on highly cultivated land and in soils richly supplied with nitrogenous fertilizers. Not enough attention is being paid to the resistance to this disease. Aurore and its derivatives proved highly susceptible, as did Fylgia, Kärn II, Brons, and Hallands. Relatively resistant were Svalöfs Kolben, Ella, and Diamant II.

Pal (B. P.), Murty (G. S.), & Khan (H. R.). **Registration of improved Wheat varieties in India.**—*Indian J. agric. Sci.*, 20, 2, pp. 165–172, 1950.

The New Pusa wheat varieties 6, 114, 120, 121, 126, and 165 [*R.A.M.*, 23, p. 432; 30, p. 405], bred at the Indian Agricultural Research Institute, New Delhi, and grown for three consecutive years at the Division of Botany, developed only a trace of yellow, brown, and black rust [*Puccinia glumarum*, *P. triticina*, and *P. graminis*, respectively: ibid., 29, pp. 405, 553; 30, p. 511]. New Pusa 4 and 111 are highly resistant to flag smut [*Urocystis tritici*: ibid., 28, p. 387]; 80–5 is resistant. N.P. 114, 120, 121, 163–3, and 163–4 are highly resistant to loose smut [*Ustilago tritici*: ibid., 27, p. 315], and 122, 124, and 165 resistant.

Stakman (E. C.) & Loegering (W. Q.). **Increase in prevalence of Puccinia graminis tritici race 15 B and P. graminis avenae race 7 in 1950.**—Abs. in *Phytopathology*, 41, 1, p. 33, 1951.

During 1950 race 15B of wheat stem rust (*Puccinia graminis tritici*) in North America [*R.A.M.*, 30, p. 221] spread and multiplied in an extraordinary manner, having been located in 12 States from Texas to the extreme north of the Union and comprising nearly a quarter of all isolates [ibid., 30, p. 314].

Race 7 of *P.g. avenae* [loc. cit.] is pathogenic to Mindo, Bonda, Clinton, and other varieties of oats deriving their resistance from White Tartar. In 1950 it was collected from Florida to Texas and northwards to the Canadian boundary, constituting nearly half of all the isolates from the United States. Race 8 of *P.g. avenae* [loc. cit.], which attacks varieties with the Richland type of resistance, was also widespread, comprising about one-fifth of all isolates, the remainder of which were of race 2 [loc. cit.]. Possibly the two dangerous races, 15B of *P.g. tritici* and 7 of *P.g. avenae*, can now maintain themselves independently of barberries.

Richards (G. S.). **Factors influencing sporulation by Septoria nodorum.**—*Phytopathology*, 41, 7, pp. 571–578, 1 fig., 1951.

At the University of West Virginia a local isolate of *Septoria nodorum* from infected wheat glumes grew well under all the experimental conditions tested, but those permitting sporulation were more limited [cf. *R.A.M.*, 24, p. 222]. Spore production was influenced by both light and temperature to a greater extent than vegetative growth and in a different way. Thus, cultures incubated under continuous light of approximately 100 foot-candles near 20° C. gave rise to a profusion of pycnidia, few or none of which, on the other hand, developed under low light intensities or at 18° or 24°. Sporulation occurred on 40 out of the 48 semi-synthetic media tested, galactose-glucine agar supporting the greatest number of pycnidia, and was very dependent on a suitable source of nitrogen, carbon being less important in this respect. Flooding of the agar plates with a heavy spore suspension yielded better spore production than any other form of inoculation.

Tapke (V. F.). **Influence of preinoculation environment on the infection of Barley and Wheat by powdery mildew.**—*Phytopathology*, 41, 7, pp. 622–632, 2 figs., 1951.

Some of the results of the author's studies at the Plant Industry Station, Beltsville, Maryland, on the influence of pre-inoculation environmental conditions on the infection of barley and wheat by powdery mildew (*Erysiphe graminis*) have already been published (abs. in *Phytopathology*, 38, p. 25, 1948; 39, p. 505, 1949) [*R.A.M.*, 30, p. 222]. From a survey of the available data in their entirety it is concluded that the degree of pre-disposition to the disease is not necessarily governed by a predominant type of weather popularly characterizing a season as 'hot', 'cool', 'wet', 'dry', and so forth, but rather by the condition of the plants as determined by the interaction of all the factors involved in growth. Environment may influence simultaneously immediate infection and conditioning of the host to subsequent attacks. Knowledge of the enhanced susceptibility of tender plants and of the doubtless frequent existence of pseudo-resistance of environmental origin in susceptible varieties should facilitate breeding for resistance and expedite reduction of the present heavy loss in affected areas.

Tyner (L. E.). **Control of loose smut of Barley by chemical and physical treatments.**—*Sci. Agric.*, 31, 5, pp. 187–192, 1951.

In 1950 experiments were carried out at the Dominion Laboratory of Plant Pathology, Edmonton, Alberta, on the control of barley loose smut (*Ustilago nuda*) [*R.A.M.*, 30, p. 264] by seed treatment. Infected Montcalm seed was subjected, prior to planting, to various chemical solutions and supersonic vibrations. The best control was obtained by a 40-hour immersion of pre-soaked (six hours in water) seed in 0·2 per cent. spergon: one smutted plant out of 489. Treatment, however, reduced the stand of healthy plants by 20 per cent. The numbers for the untreated (soaked and dry) seed were 12·2 and 24 smutted out of 120 and 153 plants, respectively. A vibration frequency of 2·5 megacycles per sec. transmitted from a Hughes Supersonic Flaw Detector (100-watt) to water-immersed seed agitated in a small tank, was the most successful in supersonic control, significantly reducing smut infection from an average of 82 in 185·4 plants to 48·2 in 158·8.

Arny (D. C.). **Inheritance of resistance to spot blotch in Barley seedlings.**—*Phytopathology*, 41, 8, pp. 691–698, 1951.

Further studies at the Wisconsin Agricultural Experiment Station on the inheritance of resistance to spot blotch (*Helminthosporium sativum*) in barley seedlings [*R.A.M.*, 25, p. 107] indicated that the difference between susceptibility and

resistance to the disease is attributable to a single factor pair, with susceptibility dominant. This reaction has been found only in the Lion variety and some of its derivatives. No correlation could be established between the spot blotch reaction and any of the seven linkage groups represented by two-rowed versus six-rowed, lemma and pericarp colour, hulled versus naked, hoods versus awns, barbing of awns and rachilla hair length, the xantha chlorophyll deficiency, or response to stem rust [*Puccinia graminis*: ibid., 26, p. 448]. In one cross (Lion × Oderbrucker) susceptibility to *H. sativum* was apparently associated with resistance to stripe (*H. gramineum*) [see above, p. 603].

Rosen (H. R.) & Murphy (H. C.). **A race of crown rust of Oats apparently new to the United States.**—Abs. in *Phytopathology*, 41, 1, p. 31, 1951.

In the autumn of 1949 a physiologic race of *Puccinia coronata* was encountered on oats in Arkansas which appears to be rather similar to race 55, reported from Argentina [*R.A.M.*, 29, p. 353]. The reaction to it of Bond is susceptible, while that of Victoria is intermediate to susceptible in the greenhouse but only intermediate out-of-doors. Most of the Victoria derivatives react similarly to their progenitor, with certain possible exceptions, such as Fulgrain 8, which appears to be fully susceptible. Under natural conditions Landhafer, Ukraine, Rainbow, Santa Fe × Clinton C.I.5400, Shands' C.I.4508, and Rosen's selections of R22–36b–9 are resistant, while the following (besides Bond) are susceptible: Richland, Minrus, Mindo, Canuck, Clinton, Cherokee, Nemaha, Colo, Bonda, Columbia, Shelby, Andrew, Forward × (V–R) × Forward, Ithacan × Victoria, Columbia × (V–R) C.I. 5297, Columbia × Marion, LeConte, and (Iowa D69–Bond) × Fultex.

Peturson (B.). **Recent changes in the relative prevalence of physiologic races of crown rust in Canada.**—Abs. in *Phytopathology*, 41, 1, p. 59, 1951.

Annual surveys have been made since 1929 to determine the prevalence and geographical distribution of the physiologic races of *Puccinia coronata* occurring on oats in Canada [*R.A.M.*, 26, p. 385]. From 1929 to 1945 races 1, 2, 3, 4, 5, and 6 comprised 95 per cent. or more of all the isolates identified. In 1938 the first isolates of races capable of attacking varieties with the Bond type of resistance were identified as 34, 45, and 47. From 1938 to 1945 the proportion of those races to the total inoculum was negligible, but since 1946 and 1947 there has been a noticeable increase in their prevalence. In 1948, 1949, and 1950 they constituted 18, 47, and 70 per cent., respectively, of all the isolates identified. The increase in the predominance of these races in Canada coincides with an expansion of cultivation in the United States of new oat varieties with the Bond type of crown rust resistance [ibid., 30, p. 225, and preceding abstract].

Dim-Zajec (V.) & Mastnak (A.). **The production of ergot (Claviceps purpurea) in Croatia. I. II.**—*Farm. Glasn.*, 7, pp. 1–7, 44–51, 1951. [Abs. in *Chem. Abstr.*, 45, 16, p. 7306, 1951.]

A nutrient broth proved to be equally suitable with one of wheat for the cultivation of the ergot fungus (*Claviceps purpurea*) [*R.A.M.*, 29, p. 330] in experiments in Yugoslavia. The field inoculation of rye was best accomplished by means of cultures not more than a month old, the maximum yield of ergot being obtained with suspensions containing 800 to 1,000 conidia per ml. Barley reacted positively to inoculation with *C. purpurea* [ibid., 28, p. 525], whereas tests on wheat were unsuccessful. The sclerotia collected on grasses contained a larger quantity of alkaloids than those from rye. Collections should be made two or three times a year to ensure optimum results. The maximum yield of ergot was obtained by the inoculation of rye at the inception of heading.

Taylor (G. S.), Semeniuk (G.), & Melhus (I. E.). **Guatemalan Corn as a source of resistance to Helminthosporium turcicum in Maize.**—Abs. in *Phytopathology*, 41, 1, pp. 34–35, 1951.

Certain native types of maize in Guatemala showed a high degree of resistance to the indigenous strains of *Helminthosporium turcicum* [*R.A.M.*, 29, p. 504; 30, p. 409], which appear from the results of limited tests to be identical with those occurring in the United States [ibid., 29, p. 361]. With a view to the incorporation of the high resistance of the Guatemalan material into United States maize, several inbreds of the latter were crossed with the former at the Iowa Agricultural Experiment Station, where the Guatemalan maize, the inbreds, and the hybrids between them were assessed by inoculation for their reaction to United States cultures of *H. turcicum* in the field and greenhouse during 1948 and 1949. In the field the Guatemalan lines proved highly resistant, the inbreds highly susceptible, and the hybrids resistant. Similar responses were obtained on seedlings in the greenhouse. Advanced hybrid generations segregated for resistance; some of the first backcrosses to the susceptible United States inbred parents were resistant and others susceptible. This behaviour reflected the heterozygous condition of the open-pollinated Guatemalan maize used in the original crosses.

Gaudineau [Marguerite]. **Les maladies cryptogamiques du Maïs.** [Cryptogamic diseases of Maize.]—Extrait du 2e Congrès International du Maïs, Pau, 1–4 Décembre, 1949, 15 pp., 2 pl., [? 1951].

Descriptions are given of the symptoms, geographical distribution, etiology, control of, and varietal reaction to various maize diseases including rust (*Puccinia sorghi*) [*R.A.M.*, 30, p. 563] and smut (*Ustilago maydis*) [ibid., 26, p. 285], which are already present in France. Inflorescence smut (*Sphacelotheca reiliana*) [C.M.I. map No. 69]; ear rot caused by *Fusarium* [*R.A.M.*, 30, p. 34], *Diplodia*, *Nigrospora* [*oryzae*: ibid., 30, p. 24], and *Gibberella zeae* [ibid., 30, p. 563]; dry rot (*D. zeae* and *D. macrospora*) [loc. cit.]; charcoal rot (*Macrophomina phaseoli*), and Stewart's disease [*Xanthomonas stewarti*: ibid., 30, p. 564] have not yet been reported from France although it is feared that the last-named may eventually be introduced since it already occurs in Italy [ibid., 29, p. 463]. There is a comprehensive list of titles, grouped according to the diseases dealt with.

Memoria de la quinta reunión de Maíz 27 y 28 de Julio de 1950 en la Estación Experimental Pergamino. [Report of the fifth Maize Conference 27th and 28th July, 1950, at the Pergamino Experiment Station.]—211 pp., 2 figs., 2 diags., 5 graphs, 1950. [Mimeographed.]

The following contributions to the pathology of maize in Argentina are presented in this report. According to H. J. Savoia, E. F. Godoy, and O. Bruni (pp. 21–27), foot rot was widespread in 1946–7 in the Pergamino district, where the average incidence of infection was 20 per cent. In 1948–9 the disease was reported from the north of Buenos Aires and the south of Santa Fé in proportions ranging from 10 to 50 per cent. Material examined in 1947 yielded *Gibberella saubinetii* [*G. zeae*: cf. *R.A.M.*, 18, p. 316], *Fusarium moniliforme* [*G. fujikuroi*: ibid., 23, p. 101; C.M.I. map No. 102], and *F. scirpi*, while the fungi isolated in 1948–9 from numerous samples of diverse origin included *Sclerotium bataticola* [*Macrophomina phaseoli*: *R.A.M.*, 25, p. 579], *F.* spp., and very occasionally *Pythium* sp. and *Rhizoctonia* sp. During the season of 1949–50, characterized by an exceptionally dry summer, *M. phaseoli* assumed an important role and was, in fact, the sole agent of foot (charcoal) rot. The needle puncture method of A. L. Smith *et al.* [ibid., 17, p. 811] proved efficient in inoculation experiments on 25 inbred lines and hybrids with isolates of *M. phaseoli*, *G. zeae*, and *Diplodia zeae* from maize and one of *G. zeae*

from wheat. Only *M. phaseoli* induced the typical symptoms of natural infection in the inoculated plants. The pathogenicity of the other species was of a much lower order and their effects on the plants differed from those observed in nature. A high degree of resistance to *M. phaseoli* was shown by 5675, CF20, 12–29, BZ8, CM1, and AD3 (all flint), CM1 × AD3, 38–11, WF9 (all dent), AD3 × WF9, WF9 × 38–11, FO3 (dent) × BZ8, BK (flint) × BZ8, and CK23 (flint) × AD3.

H. J. Savoia and R. A. Abalo (pp. 29–33) give particulars of the reactions of commercial varieties, hybrids, and breeding material to very severe natural infection by *M. phaseoli* in 1950. The most resistant varieties were Colorado Manfredi and Colorado S.C.39 (65) M.A. Besides those already mentioned, the following lines and hybrids were among the most promising: LT1, KA51, and DJ2 (flint), R4 and L317 (dent), CM1 × CF20, CM1 × 5765, CM1 × CH, 12–29 × 5765, 12–29 × CH, CH × CF20, 12–29 × CF20, 5765 × 108, CM1 × 108, CM1 × CJ7, and 12–29 × AD3. The best of the back-crosses were (CM1 × CJ7) × (BZ × 02), (CM1 × CJ7) × (AD3 × 12–29), (CM1 × AD3) × (BZ8 × L111), (CM1 × BX6) × (AD3 × CK23), (CB19 × CJ7) × (CM1 × AD3), and (CM1 × AD3) × (5765 × 02).

In the course of a discussion on maize smut [*Ustilago maydis*: ibid., 26, p. 100] (pp. 35–36), E. F. Godoy stated that the maximum percentage of infection in the fields round Pergamino in 1948–9 was 14. H. J. Savoia noted that the formation of smut galls is promoted by injuries. Thus, in a batch of plants denuded of their ears, 100 per cent. infection developed at the site of insertion, whereas those left intact remained healthy. U. F. Rosbaco observed a much higher percentage (90 to 100) of *U. maydis* among dent than among smooth types of maize (maximum 30).

Fraser (Lilian). **Florida gummosis disease found in Curlwaa orchards.**—*Agric. Gaz. N.S.W.*, 62, 5, p. 280, 1951.

A disease apparently identical with 'Florida gummosis' [*R.A.M.*, 10, p. 727; cf. 18, pp. 100, 518] has been observed on a few grapefruit and Washington Navel orange trees at Curlwaa, New South Wales. An outbreak also occurred at Red Cliffs, Victoria. The disease caused blistering and splitting of the bark and extensive gum formations along the trunk and branches.

Bliss (D. E.). **The destruction of Armillaria mellea in Citrus soils.**—*Phytopathology*, 41, 8, pp. 665–683, 3 figs., 1951.

The results of 15 years' laboratory and field experiments directed towards the control of *Armillaria mellea* on citrus in California by means of soil disinfestation are fully described and tabulated. Some of the information thus obtained has already been published [*R.A.M.*, 28, p. 214]. Carbon disulphide proved superior to chloropicrin and ethylene oxide for the end in view because of its high vapour pressure and its ability to penetrate deeply into soil. Applied at a depth of 1 ft. in holes at 18-in. staggered intervals, a dosage of 26·3 ml. per sq. ft. (302 gals. per acre) eliminated the fungus to a depth of 7 ft. in coarse sand and 5 ft. in fine sandy loam. *Trichoderma viride* developed rapidly in the fumigated soil, and its strong antibiotic action on *A. mellea*, beginning a week after the application of the chemical and completed about 24 days later, is considered to have been primarily responsible for the success of the treatment. When *T. viride* was grown in sterilized soil, it killed the *Armillaria* even without fumigation. The reason for the rapid development of *T. viride* in fumigated orchard soil is not known.

Wellman (F. L.). **Tree defoliation for control of Omphalia disease of Coffee.**—Abs. in *Phytopathology*, 41, 1, p. 38, 1951.

Omphalia flavida [*Mycena citricolor*: C.M.I. map No. 9; *R.A.M.*, 30, p. 390] has been shown by recent studies to depend largely for dissemination on its relatively

heavy, macroscopic fructifications, which are readily detached from the lesions on coffee when wet and travel from one tree to another in droplets of rain water. The proper application of the recommended treatment with Bordeaux mixture is physically and economically impracticable under the usual plantation conditions, and an alternative method of control, involving the defoliation of severely infected trees, was tested in 15 plots under ideal conditions for the leaf spot at Turrialba, Costa Rica [ibid., 18, p. 589]. The removed foliage was left to decay on the ground. The new leaves developing in six weeks remained healthy and the trees regained their vigour. In some of the treated plots the production of flowers and fruits exceeded that of the untreated by upwards of 1,000 per cent.

Knight (R. L.). **The genetic control of blackarm disease (Xanthomonas malvacearum) in Cotton.**—'Extrait', [C.R.] 5e Congrès international de Pathologie comparée, Istanbul, 13–19 mai, 1949, 11 pp., [? 1951].

In this paper the author summarizes that results of fourteen years' work on the genetic control of cotton blackarm disease (*Xanthomonas malvacearum*) [*R.A.M.*, 29, p. 465].

Rockwood (L. P.). **Entomogenous fungi of the family Entomophthoraceae in the Pacific Northwest.**—*J. econ. Ent.*, 43, 5, pp. 704–707, 1950.

Under favourable conditions epizoötics of entomophthorous fungi reduce large and destructive outbreaks of certain insect pests in the Pacific Northwest to negligible proportions. In the Willamette Valley of Oregon, for instance, the larvae of the clover leaf weevil (*Hypera punctata*) are annually restrained from causing appreciable damage to clovers and lucerne by *Entomophthora sphaerosperma* [*R.A.M.*, 14, p. 33; 28, p. 125]. The ubiquitous *Empusa* [*Entomophthora*] *aphidis* [ibid., 25, p. 262; 28, p. 302] has several times decimated enormous populations of the pea aphid (*Macrosiphum pisi*) on vetch and Austrian winter field peas, and the plants have recovered from severe injury. So widespread is the fungus locally that the results of chemical control experiments cannot be rightly appraised unless the incidence of fungal disease is taken into consideration. Pea aphids may also sustain joint attacks by *E. aphidis* and *Empusa thaxteriana* [ibid., 17, p. 240], of which the former appears to be the more effective in the Willamette Valley, while in more arid regions (mean annual rainfall about 10 in.) the latter may be better fitted for survival by means of its resting spores. Neither species, however, seems to act as a serious check to pea aphid populations east of the Cascade Mountains. *M. pisi* on Scotch broom [*Cytisus scoparius*] and *M. granarium*, *Aphis rhopalosiphum prunifoliae*, and *Myzus persicae* on oats are occasionally attacked by *E. fresenii* [ibid., 19, p. 213], while caterpillars, particularly noctuid larvae, are often destroyed by *E.* [*Entomophthora*] *virescens*. Other entomogenous fungi occurring locally include *Empusa grylli* [ibid., 29, p. 89], infesting the grasshoppers *Melanoplus femur-rubrum* and *M. mexicanus* on lucerne, *E. muscae* [ibid., 26, p. 544] on Syrphid flies and Scatophagidae, and *E.* (?) *forficulae*, which is probably an important factor in the natural control of the European earwig (*Forficula auricularia*).

Particulars are given of experiments in the culture of *Entomophthora aphidis* on artificial media [cf. ibid., 30, p. 415] with a view to its dissemination in the field. The fungus grew readily on egg, fish, meat, potato, and carrot, the cultures remaining viable for three months at 50° F. and for four at 36°. Inoculation experiments on pea aphids in 1936 with a strain of *E. aphidis* that had been in culture since 1934 resulted in a kill of 36 per cent. compared with an average of 95 per cent. for a freshly cultured strain and for the fungus from an aphid. The entomophthorous fungi on aphids died soon after sporulation, which was usually over in one or two nights, and the carcasses were then overrun by saprophytes, such as *Mucor*. It is concluded from these results that the artificial inducement of epizootics

among insect pests by the use of Entomophthoraceae appears considerably less possible than with the hyphomycetous fungi.

Dasher (R. M.). **New sprays and dusts.**—*Amer. Rose Annu.*, 35, pp. 139–144, 1950.

In the latest experiments at Florence, Alabama, rose black spot [*Diplocarpon rosae*] was effectively combated and eradicated, without injury to the foliage, by spraying with fermate as recommended by L. M. Massey [*R.A.M.*, 26, p. 107]. Zerlate caused damage to the leaves, and in the case of phygon the margin of safety between an effective and a phytotoxic dosage was very narrow.

Copper hydroxyquinolinolate (plant mildew spray) [ibid., 30, p. 468] gave satisfactory control of mildew [*Sphaerotheca pannosa*] and was compatible with all the insecticides tested. Its compatibility with fermate, however, remains in doubt, although in no case did the combination of the two compounds result in such severe foliar injury as that due to sulphur or the fixed coppers.

Jensen (D. D.) & Gold (A. H.). **A virus ring spot of Odontoglossum Orchid: symptoms, transmission, and electron microscopy.**—*Phytopathology*, 41, 7, pp. 648–653, 2 figs., 1 graph, 1951.

From the University of California, Berkeley, the authors describe a virus disease of *Odontoglossum grande* differing markedly in symptomatology from other orchid viruses. Minute, necrotic spots or rings appear on the surface of one or more of the older inoculated leaves, while the younger ones show light green to pale yellow, circular, oval, or diamond-shaped areas, 0·5 to 2 cm. in diameter, which may be sharply delimited or present only a mild halo effect. A few weeks later the outline of some rings may be partially or wholly necrotic, while the central portion remains pale green or yellow. The upper surface of the entire zone may become necrotic and the lower appear watersoaked. The necrotic rings are usually single, but there may be several concentric, brown to black circles with green to yellow tissue between and a central necrotic spot. The ring spots may be separated from each other by normal tissue or coalesce to form larger compound patterns. In the case of three plants inoculated on only half of each leaf, the first symptoms were observed on the inoculated halves after about a fortnight and on the uninoculated two to four weeks later. Transient symptoms in the form of irregular, chlorotic, ovoid areas may develop on fully expanded leaves produced by the youngest bulbs, but no sign of infection was discernible on the flowers of two diseased plants inoculated seven months earlier.

The available evidence indicates that the ring spot virus exerts an initial shock effect on *O. grande*, expressed by the production of conspicuous foliar symptoms, whereas later growth seems to harbour the infective principle without noticeable external symptoms. Juice from a symptomless new bulb of the original diseased plant and from its apparently unaffected foliage proved to be infectious on inoculation into healthy plants. Electron micrographs of the orchid ring spot virus revealed rod-shaped particles, with a tendency to slight curvature, about 24 mμ in width and commonly 280 mμ long.

None of the 20 species representing 18 genera in 11 families contracted the ring spot in mechanical inoculation experiments with expressed sap from diseased plants.

Gold (A. H.) & Jensen (D. D.). **An electron microscope study of Cymbidium mosaic virus.**—*Amer. J. Bot.*, 38, 7, pp. 577–578, 1 fig., 1 graph, 1951.

An electron microscope study at the University of California, Berkeley, of a virus from mosaic-affected *Cymbidium* plants [*R.A.M.*, 30, pp. 469, 559] showed the particles of *Cymbidium* mosaic virus to be sinuous rods generally measuring about 18 by 475 mμ. No comparable particles were found in healthy plants. Inoculations

with the purified preparation produced mosaic in *Cymbidium* seedlings and these were also shown to contain similar particles.

Tompkins (C. M.) & Tucker (C. M.). **Stem and root rot of Daphne odora caused by Phytophthora parasitica.**—*Phytopathology*, 41, 7, pp. 654–655, 1951.

The first record of *Phytophthora parasitica* as an agent of stem and root rot of *Daphne odora* [cf. *R.A.M.*, 26, p. 480] in California was from a culture supplied by J. T. Middleton in 1940, in which year the fungus was also isolated from a crown rot of *D.* sp. by P. A. Miller. Environmental factors conducive to the inception and spread of the disease comprise excessive irrigation, inadequate drainage, and cool weather. Plants of all sizes appear to be susceptible to infection, the first indication of which is the development at or near soil-level of dark brown to black, irregular, watersoaked lesions, later coalescing and often girdling the stem. Both the external and the corresponding internal discoloration may extend for several centimetres above soil-level, while all the crown and underground system is involved. The rapid disintegration of the roots is accompanied by severe wilting of the foliage and flowers and may be followed at an advanced stage by collapse of the plant. The morphology of the isolates from *D. odora* and their mycelial growth on maize meal agar (pH6) at 25° C. were indistinguishable from those of a tomato strain of *P. parasitica* [ibid., 30, p. 392] from Missouri.

In soil inoculation experiments isolates from *D. odora* were pathogenic to all the 14 plants of the same host on which they were tested. All the infected plants died within a fortnight after the symptoms were well advanced. The fungus was reisolated from each infected plant and proved to be identical and equally pathogenic with the original isolates. One strain of the pathogen from *D. odora* caused the death of 12 young, healthy plants of *D. cneorum* within a month of inoculation.

Tompkins (C. M.) & Middleton (J. T.). **Etiology and control of Poinsettia root and stem rot caused by Pythium spp. and Rhizoctonia solani.**—*Hilgardia*, 20, 9, pp. 171–178, 4 pl., 1950. [Received June, 1951.]

A root and stem disease of poinsettia (*Euphorbia pulcherrima*) characterized by wilting, abscission of the lower leaves, and dark brown stem lesions which may girdle the stem completely, causing it to shrivel and lodge, has been responsible for considerable losses at Encinitas, San Diego county, and in the San Francisco Bay region of California for the past fifteen years. Infected plants usually die quickly but occasionally they survive in a stunted condition. The disease is favoured by overcrowding, excessive soil moisture and humidity, and air temperatures above 80° F. or below 60°. The principal causal organisms are *Pythium debaryanum*, *P. perniciosum*, *P. ultimum*, and *Rhizoctonia* [*Corticium*] *solani*. All proved highly pathogenic when added to wet autoclaved soil of potted plants in the greenhouse. The incubation periods ranged from 8 to 23 days for *Pythium* spp., and from 6 to 8 days for *C. solani*. The varieties Oak Leaf, Mrs. Paul Ecke, Henrietta Ecke, and Albert Ecke proved highly susceptible.

The disease may be controlled in the propagation benches by steam or chemical sterilization of the sand in which the cuttings are to be rooted. Ferbam has given good results when dusted on the sand surface and on the cuttings themselves immediately before rooting. The use of sterilized pots and soil at transplanting time is essential, while correct culture conditions are also important.

Dimock (A. W.). **Poinsettia trouble as result of root rot.**—*Bull. N.Y. St. Flower Grs*, 69, pp. 4–8, 5 figs., 1951.

Inoculation studies at the Department of Plant Pathology, Cornell University, New York, have shown that *Thielaviopsis basicola* and a species of *Pythium* [see

preceding abstract] were largely responsible for root rot disease of poinsettia [*Euphorbia pulcherrima*]. Other factors such as deterioration of parent plants, virus diseases, deficiency of one or more nutrient elements, and chilling of the plants may in some cases have contributed to the disease, and they certainly helped the development of root rot and the expression of disease symptoms, but only *Pythium* and *T. basicola* induced all the symptoms typical of the disease. The symptoms on the aerial parts indicative of root rot are dwarfing, small, narrow or crinkled leaves, which are pale and sometimes with bronzed areas between the veins; flower head irregular, often quite one-sided, and floral bracts extremely narrow; severe premature leaf drop below the flower head, and the stem developing an abnormal reddish colour. In most cases these symptoms became evident soon after panning though some plants remained apparently normal until mid-November.

Control measures are the same as those recommended for *Pythium* [loc. cit.] and they apply also to *Rhizoctonia* root and stem rots.

Limber (D. P.). **New records of Coniothyrium hellebori in the United States.**—*Plant Dis. Reptr*, 35, 6, p. 277, 1951. [Multilithed.]

Coniothyrium hellebori, the cause of black leaf spot of *Helleborus niger* [*R.A.M.*, 29, p. 467], has already been reported from Maryland, New York, and Oregon (*Plant Dis. Reptr*, 32, p. 536, 1948). It was also collected in California in 1933, New Jersey in 1950, and at two locations in Ohio in 1951.

Weber (G. F.) & Roberts (D. A.). **Silky threadblight of Elaeagnus pungens caused by Rhizoctonia ramicola n.sp.**—*Phytopathology*, 41, 7, pp. 615–621, 2 figs., 1951.

Silky thread blight of the ornamental shrub *Elaeagnus pungens*, first observed in Florida in 1945 and hitherto found only in that State, has also been observed on *Ilex crenata*, *Erythrina herbacea*, *Pittosporum tobira*, *Lagerstroemia indica*, and *Feijoa sellowiana*, and was pathogenic in inoculation experiments to *Gelsemium sempervirens*, *Rhododendron indicum*, and *Pyracantha formosana*. During warm, humid weather, short, delicate, grey to olivaceous hyphal strands extend across the leaf axils and grow along the surfaces of twigs as far as 20 mm. above and below the bases of infected petioles. Dead leaves may be matted together or held suspended from the twigs by these hyphae, denser mats of which usually appear at the point of contact of diseased and healthy leaf blades, binding them together. Lesions appear at first as necrotic spots, which slowly enlarge to a maximum diameter of 25 mm. and occasionally involve the entire lamina; at maturity the tan, necrotic centres are surrounded by purplish-brown margins and the affected areas are brittle in texture, cracking and falling away under slight pressure. Partial infection of the blade does not result in defoliation and the diseased leaves persist throughout the autumn and winter. The discoloration of infected petioles is followed by cortical necrosis and sloughing-off of the diseased tissues.

The causal organism of the thread blight is a *Rhizoctonia* differing from the mycelial state of *Corticium stevensii* and *C. microsclerotia* [*R.A.M.*, 19, p. 3], and from *R. zeae* [ibid., 14, p. 232] in the absence of sclerotia, from *C. salmonicolor* in lacking the pink hymenium, and from *C. koleroga* in its short, fine, filamentous, olivaceous-brown hyphae, and is accordingly designated *R. ramicola* n.sp. On 2 per cent. potato dextrose agar the septate hyphae, 22 to 155 by 3·5 to 7·7 μ, branch at acute angles when young and rectangularly at maturity; at this stage a lavender tint is a diagnostic character of the species. The optimum temperature for its growth in culture was about 29° C., corresponding to the most favourable range in nature of 25° to 30°, accompanied by a relative humidity of or above 75 per cent. In comparative tests with *C. solani*, *R. ramicola* grew less rapidly below 24° but

more quickly above that point. A temperature of 37° was lethal to both species. The optimum pH for the growth of *R. ramicola* in culture was near 6·3.

Creuzburg (U.) & Wenzl (H.). **Botrytisschäden an Goldribes (Ribes aureum) in Österreich.** [*Botrytis* injury to Golden Currant (*Ribes aureum*) in Austria.]—*PflSch. Ber., Wien*, 4, 7–8, pp. 97–98, 1950. [English summary.]

In the summer of 1949, following abnormally wet weather, some 5 per cent. of the parent stocks of *Ribes aureum* in a Styrian nursery exhibited necrosis of a few of the one-year-old shoots due to infection by *Botrytis cinerea*, not previously recorded on this host in Austria.

Westcott (Cynthia). **Diseases and pests of Dogwood trees.**—*Plants and Gardens* (*Brooklyn Bot. Gdn Rec.*), 7, 2, pp. 136–137, 4 figs., 1951.

Symptoms and control of three diseases of flowering dogwood trees [*Cornus* spp.] are described. Careful transplanting and the protection of the trunk against lawn mowers by some kind of a guard are suggested as a control of crown canker (*Phytophthora cactorum*) [*R.A.M.*, 17, p. 182; 22, p. 459], which is particularly prevalent on Long Island. A new tree should not be planted in the place where there has been a death from such a disease. Mention has already been made of the control of spot anthracnose (*Elsinoe corni*) [ibid., 30, p. 110], present in Maryland and other southern States, though it may not be practicable. *Botrytis cinerea* causes spectacular flower blight followed by leaf blight [ibid., 27, p. 503] in the New York area in wet seasons. The expense of control measures, however, is probably not justified.

Gerdemann (J. W.). **Effect of seed treatment on forage legumes in wet and dry soil.**—*Phytopathology*, 41, 7, pp. 610–614, 1951.

At the Department of Agronomy, University of Illinois, Urbana, arasan, ceresan M, and phygon at concentrations of 0·25, 0·5, and 1 per cent. on seed of red clover, lucerne, and sweet clover (*Melilotus alba*) sown in wet and dry soil [cf. *R.A.M.*, 20, p. 211; 24, p. 60; 29, p. 100; 30, p. 273] gave no significant increase in emergence. One per cent. ceresan M injured lucerne seedlings in wet and dry soil in the greenhouse and 1 per cent. phygon diminished field stands when drought prevailed. Sweet clover emergence was raised by seed treatment with arasan and some of the lower rates of ceresan M used in greenhouse tests. Arasan, apparently beneficial or harmless in the greenhouse, significantly reduced emergence under excessively dry conditions in the field.

It is concluded that field recommendations for forage legume seed treatment should be based on experiments conducted in many soil types and under varied environmental conditions.

Lamberts (H.). **Resistentie tegen aantasting door Fusarium oxysporum in gele Lupine.** [Resistance to infection by *Fusarium oxysporum* in yellow Lupin.]—*Landbouwk. Tijdschr., Wageningen*, 63, 7, pp. 458–459, 1951. [English summary.]

In a field test in 1950 five wild Portuguese strains of yellow lupin were found to be completely resistant to the destructive wilt caused by *Fusarium oxysporum* [f. *lupini*], first observed in Holland in 1948 [*R.A.M.*, 29, p. 495], while partial resistance was shown by a further seven of the same origin. Part of the progeny of the resistant strains (arising through free pollination) was inoculated with the fungus; out of a total of 60 plants 48 remained healthy, thereby establishing the existence of genetic resistance to the disease, though the mode of inheritance has not yet been elucidated.

Ignatovicz (G. M.). **Typhula trifolii Rostrup**—Паразит красново Клевера. [*Typhula trifolii* Rostrup—a Red Clover parasite.]—Докл. Ленина Акад. сельскохоз. Наук [*Rep. Lenin Acad. agric. Sci.*], *1951*, 4, pp. 37–42, 2 figs., 1951.

In studies at the Pskov Flax Experiment Station, U.S.S.R., from 1948 to 1950 *Typhula trifolii* [*R.A.M.*, 7, p. 450] was found to be one of the reasons for clover failure in the fields of the district. Infection occurs during the sowing year and the harmful activity of the fungus increases in winter and in the older stages, maximum failure of the plants being in the third year, mainly on low-lying, damper, and more acid soils. In spots where there has been a clover failure the formation of sclerotia occurs and they appear on the soil surface. The basidial stage develops for the most part at the end of the summer and in the autumn, although occasional instances are noticed during the whole growth period. The mycelium, appearing as very fine, white threads, can be seen on the surface of the soil near the collar of first and second year plants. Artificial infection with mycelium and basidiospore suspensions induces the formation of necrotic spots after nine to 11 days and the plant is killed after three months. Acidified potato, rice, and boiled potato agars were favourable artificial media for the development of the mycelium.

Deep autumn ploughing and reploughing of the fields, drainage, field sanitation, lime application, and seed treatment with NIUIF–2 (granosan) [ibid., 30, p. 563] are recommended as preliminary measures for the control of *T. trifolii*.

Memoria de la tercera reunión de plantas forrajeras 3 y 4 de Octubre de 1950 en la Estación Experimental Rafaela. [Report of the third conference on fodder plants 3rd and 4th October, 1950, at the Rafaela Experiment Station.]—211 pp., 11 figs., 1 graph, 1950. [Mimeographed.]

The papers comprised in this useful compilation are largely concerned with various aspects of fodder crop breeding in Argentina.

Heavy losses in the 1947–8 lucerne crop at the Pergamino Experiment Station were investigated by H. Serrano (pp. 11–13). Some of the plants shrivelled just before beginning to flower, others while flowering or even after fruiting normally. The chestnut to chestnut-yellow decay of the root tissues originated on one side and gradually girdled the entire root, spreading generally to about 8 in. above soil-level. The trouble was initially attributed to a nematode, but of 575 plants inspected in a six-year-old stand, only 85 (14·8 per cent.) showed exclusive nematode infestation, 32 (5·6) were affected by a combination of nematode and root rot, while 186 (32·3) were suffering from the root rot alone. When the same stand was ploughed up 882 roots from a depth of 10 to 15 cm. in 12 furrows covering an area of 180 sq.m. were examined, of which 86·6 per cent. were found to be diseased. Evidently, therefore, the root rot is among the principal causes, if not the main one, of the premature dying-off of the local lucerne stands.

The following symptoms of the same kind of root rot were observed by H. J. Savoia and O. Bruni (pp. 17–19) in their studies in 1950 of lucerne plants in a four-year-old stand: a pale yellow discoloration of the central cylinder, on which were also present continuous or broken chestnut to reddish lines, up to 0·5 or 1 cm. in length; well-defined lesions of the same colour or chestnut to yellow up to 10 cm. in diameter, predominating in the central cylinder but sometimes embracing the entire root, and extending from the crown (which may itself be involved) to the shoot bases; and a partial or total disorganization of the roots in the form of an intensive dry, white rot, while a sparse, white or dark-coloured mycelium is sometimes present. More than 70 per cent. of the plants from different stands (especially older ones) were affected to a varying extent in the manner described. Fungi were excluded by cultural studies as agents of the disease, while the function of the

bacteria observed in tissue sections remains doubtful. The Pergamino root rot appears to be distinct from any of the lucerne disease hitherto described and it may well be closely connected with the regional deterioration of the crop.

According to F. A. Rojas (pp. 23–24) lucerne in the Manfredi district is relatively free from diseases, the most important being violet root rot (*Rhizoctonia crocorum* [*Helicobasidium purpureum*]), while others included rust (*Uromyces striatus*), downy mildew (*Peronospora trifoliorum*), leaf spot (*Pseudopeziza medicaginis*) [*R.A.M.*, 30, p. 195], and yellow leaf blotch (*Pyrenopeziza medicaginis*) [C.M.I. map No. 141].

Vaughn (J. R.). **Cycloheximide, an antibiotic effective against turf diseases.**—Abs. in *Phytopathology*, 41, 1, p. 36, 1951.

On golf greens at six localities in Michigan the incidence of dollar spot (*Sclerotinia homoeocarpa*) [*R.A.M.*, 29, p. 30], which was prevalent at five places in both spring and autumn, was consistently lower in the plots sprayed at fortnightly intervals with cycloheximide [actidione: ibid., 30, p. 184] than in those treated with other materials. Melting out (*Helminthosporium* sp.) was also controlled only by actidione, which was apparently innocuous to all the strains of bent grass [*Agrostis* spp.] composing the greens.

Monvoisin (A.). **Le traitement frigorifique des fruits et des légumes. Extrait de 'La conservation par le froid des denrées périssables.'** [The cold storage treatment of fruit and vegetables. Extract from 'The preservation by cold of perishable commodities'.]—vi+126 pp., 45 figs., 9 graphs, Fourth Edition, Paris, Dunod, 1951.

In the sections on the modifications occurring during storage (pp. 56–87) brief notes are given on fungal, bacterial, and physiological disorders of fruit in cold storage [*R.A.M.*, 25, p. 123; 29, p. 263; 30, p. 169], including *Coryneum foliicola* [ibid., 3, p. 402; 10, p. 676; 27, p. 242].

Cohen (S. I.). **Effectiveness of three phenyl mercury formulations for the control of Apple scab.**—Abs. in *Phytopathology*, 41, 7, p. 657, 1951.

Variations in the individual field performance of three phenyl mercury fungicides, viz., puratized agricultural spray, puratized apple spray, and puratized 806, used for the control of apple scab [*Venturia inaequalis*] in the United States [*R.A.M.*, 29, p. 84; 30, p. 234], prompted a comparative study of the fungitoxicity of the three compounds under similar conditions. Equimolar aqueous solutions of each preparation varied in efficiency in spore germination tests and in their growth-inhibiting concentrations against seven species each of bacteria and fungi, but solutions adjusted to contain equivalent amounts of the phenyl mercury group for each compound gave comparable results (in respect of LD–50 values and slopes) for *Stemphylium* [*sarciniforme*] and *Sclerotinia* [*fructicola*: ibid., 27, pp. 32, 367; 30, p. 380], and similar bacteriostatic and fungistatic concentrations. The results of two years' tests with common lots of these equivalent phenyl mercury solutions against apple scab on six varieties at six locations showed a generally consistent equality, apart from occasional, non-recurrent differences in one year. The carbon-mercury-nitrogen bond would appear to be the actively fungicidal component of these particular water-soluble phenyl mercury compounds.

Govi (G.). **Un cancro rugoso del Pero causato da Phomopsis mali Rob.** [A rugose canker of Pear trees caused by *Phomopsis mali* Rob.]—*Ann. Sper. agr.*, N.S., 5, 4, pp. 791–803, 9 figs., 1 graph, 1951.

A serious canker of five- to six-year-old branches of pear trees followed by die-back of the affected parts was observed in an orchard at Imola, Bologna, during the summer of 1950. At first the brick-red lesions measured 2 cm. in diameter and later completely encircled branches for up to 20 cm. The lesions were reproduced

experimentally on three-year-old branches of healthy trees, also a chestnut brown rot developed on inoculated apples and pears, affecting the whole fruit after two weeks. The fungus, identified as *Phomopsis mali* [*Diaporthe perniciosa*: *R.A.M.*, 25, p. 399], causes dead arm in the United States and die-back [loc. cit.] in England, but for the Italian denomination the author proposes 'rugose parasitic canker of pear trees'. He agrees with Kidd and Beaumont in uniting the conidial states on apple, pear, plum, peach, and apricot under *P. mali* [ibid., 4, p. 174].

Wenzl (H.). **Steigerung der fungiziden Wirksamkeit von Winterspritzmitteln im Frostspritzverfahren.** [Enhancement of the fungicidal efficacy of winter sprays in the frost spray procedure.]—*PflSch. Ber., Wien*, 4, 7–8, pp. 110–116, 1950. [English summary.]

Tests were carried out at the Vienna Plant Protection Institute to determine the possibility of combating peach and plum brown rot (*Monilinia* [*Sclerotinia*] *laxa*) in Austria [*R.A.M.*, 30, p. 171 and next abstract] by winter spraying for the destruction of the sporodochia and prevention of their renewed development in the mummified fruits [ibid., 29, p. 102]. The efficacy of the sprays, consisting of 0·1 and 0·3 per cent. solutions of selinon-neu, a yellow preparation with dinitro-*o*-cresol as the active principle, and 3, 5, and 8 per cent. heavy tar-oil emulsions, was substantially increased (up to eight times, using sporodochial development as a criterion) by the performance of the operations at temperatures below zero (−8° C.) as reported by Beran (*PflSch. Ber., Wien*, 2, pp. 161–175, 1948; 3, pp. 161–176, 1949) in connexion with pest control experiments. The improvement thus achieved is attributed to the fact that a much smaller proportion of the fungicide runs off the twigs at −8° than at 20° (the temperature prevailing in the comparative laboratory tests).

Wenzl (H.). **Versuche zur Winterbekämpfung der Moniliakrankheit.** [Experiments on the winter control of the *Monilia* disease.]—*PflSch. Ber., Wien*, 6, 11–12, pp. 178–189, 1951. [English summary.]

A tabulated account is given of further experiments in Austria on the control of *Monilinia* [*Sclerotinia*] *laxa* on apricot and plum by winter spraying, the efficacy of which was again enhanced by carrying out the treatment at temperatures below zero [see preceding abstract]. Sporodochial development in mummified fruits was shown to be more or less preventable by complete wetting with the fungicides, of which dinitro-*o*-cresol (DNC) products, sandolin [*R.A.M.*, 29, p. 418], and selinon-neu sprays and paranicrol (a mineral oil with 4 per cent. DNC) were the most effective. Other promising treatments were 1 per cent. sodium arsenite, 3 per cent. formalin (40 per cent. formaldehyde), tar oil emulsion, lime-sulphur, and a fertilizer salt consisting mainly of potassium chloride. Owing to the technical difficulties presented by the complete wetting of the mummified fruits, their removal prior to spraying remains an essential part of the programme.

Willison (R. S.). **The effects of some stone-fruit viruses on Cucumber.**—*Plant Dis. Reptr*, 35, 6, pp. 254–255, 1951. [Multilithed.]

During 1950 one strain each of the cherry yellows [*R.A.M.*, 30, pp. 312, 477] and tatter leaf viruses [ibid., 30, p. 167] from sweet cherry, seven of the [cherry] necrotic ring spot virus [loc. cit.], and four of the prune [plum] dwarf virus [ibid., 30, p. 329] from Italian prune and sweet cherry were transmitted to Windermoor Wonder, Chicago Pickling, and National Pickling cucumber plants in Ontario by rubbing the cotyledons with aqueous suspensions of macerated, immature, virus-infected peach leaves. Attempts to transmit the viruses from immature leaves of sour and sweet cherry and plum have failed so far.

The cherry yellows strain was considerably more virulent on cucumber than any

of the others except for one strain of necrotic ring spot. Primary symptoms appeared on rubbed cotyledons in two to four days, sometimes as pale green to chlorotic spots or as rings with diffuse margins. Systemic symptoms, including vein-banding and general chlorosis, usually followed in six or seven days. The first leaf bent downwards and the unfolding leaves and axial growing points were usually killed in a week or ten days. In many series the majority of infected plants collapsed at the top and died duringthe second week. In general, transfers to cucumber from cucumber were more quickly lethal than from peach.

The tatter leaf virus was the least virulent of those used. Primary symptoms were usually chlorotic rings, merging six or eight days later into veinbanding and chlorosis. The rubbed cotyledons usually persisted for several weeks whereas with cherry yellows they often died in seven to ten days. Systemic symptoms were slow in appearing and generally consisted of veinbanding, small chlorotic spots or rings, rugosity without severe leaf distortion, shortened internodes, and retarded growth. The rate of transmission from peach to cucumber was about 30 to 40 per cent., rising to 70 per cent. or more from cucumber to cucumber but with no appreciable increase in virulence.

The primary symptoms of plum dwarf generally resembled those of tatter leaf but in some cases the cotyledons persisted and became abnormally large and very dark green, where not chlorotic. Systemic symptoms developed sooner than those of tatter leaf and the affected leaves were more often twisted, blistered, and distorted. Green portions usually became very dark. Early collapse and death of the tops of the plants was much less frequent than with cherry yellows. There was some difference in virulence between the various plum dwarf strains.

The symptoms induced by necrotic ring spot resembled those of plum dwarf except for one strain which behaved like cherry yellows.

One plum dwarf strain induced symptoms on Hubbard squash and two necrotic ring spot strains were transmitted to vegetable marrow and pumpkin. The possibility of using these plants as differential hosts is being explored.

Cain (J. C.) & Parker (K. G.). **A preliminary report on the response of virus-infected Montmorency Cherry trees to nitrogen fertilizer.**—*Phytopathology*, 41, 8, pp. 661–664, 1951.

Evidence is adduced from an orchard growing in sod at the New York (Geneva) Agricultural Experiment Station that the yellows virus of Montmorency cherries [see preceding abstract] is responsible for a rapid decline in productivity, largely through a reduction in the percentage of flowers setting fruit and in spur formation.

Over a three-year period (1947 to 1949) some improvement in growth, fruit set, and yield of infected trees was effected by the application of extra nitrogen fertilizer (15 instead of 5 lb. ammonium sulphate per tree). Thus, the average yields of 51 trees in four groups of virus ratings (none, light, moderate, and severe) treated at the lower and higher rates in 1943–6 varied from 31 to 42 lb. per tree (40 lb. average for the lower rate and 32 for the higher) with no appreciable difference among the rating groups. Yields in 1949 in terms of the 1943 to 1946 average (100) on the same trees ranged from 282 per cent. on trees with no symptoms to 62 per cent. on the severely infected (the average for the lower rate being 189 per cent. and for the higher 275); the percentages of flowers setting fruit in 1949 ranged from 22 to 2 (13 and 18), respectively, and the number of spurs formed since 1947 per 1,000 flowers in 1949 from 7·2 to 0 (3·5 and 5·1).

Parker (K. G.) & Palmiter (D. H.). **Survey for X-disease on Peach and Cherry in New York, including the first report on Sweet Cherry.**—*Plant Dis. Reptr*, 35, 6, pp. 256–258, 1951. [Multilithed.]

The authors describe the discovery of peach X-disease in peach [*R.A.M.*, 30,

p. 277], chokecherry (*Prunus virginiana*) [ibid., 30, p. 421], and sour cherry in the Hudson River Valley and western New York State and its spread since 1938. The disease was first observed on sweet cherry [ibid., 30, p. 329] in 1949 in Ontario county, and in 1950 it was found in Monroe and Chautauqua counties. The chief symptom on trees on Mazzard rootstocks is the failure of the fruit to mature. It is much paler than normal, insipid, and rather pointed in shape. Plant growth is reduced and leaf discoloration may develop along the midrib late in the season. Diseased trees on *P. mahaleb* rootstocks wilt, or decline, and die. Many roots are dead before there is any visible evidence of disease except for wilted or curled leaves. No X-disease is found in orchards when there are no wild chokecherry trees in the vicinity.

Peterson (D. H.) & Cation (D.). **Peach blossom blight control experiments.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 33, 3, pp. 218–222, 1951.

Spraying tests on the control of peach blossom blight (*Monilinia* [*Sclerotinia*] *fructicola*) [*R.A.M.*, 27, p. 532; 29, p. 286; 30, p. 476], conducted [in 1950] in an orchard on the shore of Lake Michigan and another eight miles inland, demonstrated the importance of a protective spray on the exposed blossoms just before rain or periods of high humidity. Sprays applied several days after infection had little or no effect. Blossom blight is a function of the number of spores present and of the occurrence of wet weather when the open blossoms are less than five days old, at which time they are most susceptible to infection. Even if spores are abundantly present, there will be little blight if dry conditions prevail; similarly, if few spores are present in wet weather blight will not be heavy.

Wettable sulphur was slightly better than L–8277, while two experimental materials of the Standard Oil Company, L–7752 and L–8299, gave promising results, as did lime-sulphur.

Rosella (E.). **Un ennemi des Pêchers qu'il faut combattre dès l'automne, puis en hiver : le Coryneum.** [An enemy of Peach trees which must be controlled in autumn, then in winter: *Coryneum*.]—*Progr. agric. vitic.*, 135, 9–10, pp. 128–129, 1951.

To control peach shot hole (*Coryneum* [*beijerinckii* = *Clasterosporium carpophilum*: *R.A.M.*, 28, p. 406]) under the conditions prevailing in France one application of spray in autumn followed by another at the end of winter is indispensable. If there is much branch withering or rain has fallen a supplementary application should be made at the end of November; this application is essential in orchards situated on the Mediterranean coast of France. At present copper oxychloride (1 to 1·5 per cent.) is generally used, but the author considers that a 2 to 3 per cent. Bordeaux mixture is best.

Crosse (J. E.). **The leaf scar as an avenue of infection for the Cherry bacterial canker organism, Pseudomonas mors-prunorum Wormald.**—*Nature, Lond.*, 168, 4274, pp. 560–561, 1951.

Preliminary studies at the East Malling Research Station, Kent, suggest that the bacteria causing canker of cherry trees (*Pseudomonas mors-prunorum*) [*R.A.M.*, 30, p. 49] enter the spur via the vascular traces of the leaf scar. Spurs of resistant and susceptible trees with the leaf scars exposed by inducing leaf abscission were inoculated (*a*) immediately, (*b*) after three days, and (*c*) after eight with an aqueous suspension of a 48-hour culture. The numbers of spurs killed were (*a*) 101 out of 103 inoculated, (*b*) 70 out of 102, and (*c*) 32 out of 96. Approximately the same number of spurs was killed in the resistant and susceptible trees, but in the former only 11 per cent. of those killed led to the formation of branch cankers, compared with 63 per cent. in the latter. The cankers were indistinguishable in

form and severity from those occurring naturally. On the six susceptible trees 19 of the 24 branches bearing inoculated spurs had died from girdle cankers by the following May.

Wenzl (H.). **Eine neue rotfrüchtige mehltauresistente Stachelbeersorte.** [A new, red-fruited, mildew-resistant Gooseberry variety.]—*PflSch. Ber., Wien*, 4, 7–8, pp. 106–109, 1 fig., 1950. [English summary.]

A hitherto undescribed local gooseberry variety with medium-sized, red fruits has shown a high degree of resistance to *Sphaerotheca mors-uvae* [C.M.I. map No. 16] at Höflein-on-Danube, Austria [*R.A.M.*, 29, p. 418]. It is to be named 'Mildew-resistant Höfleiner'.

Stoddard (E. M.). **A chemotherapeutic control of Strawberry red stele.**—Abs. in *Phytopathology*, 41, 1, p. 34, 1951.

Units of 10 strawberry plants growing in sand [? in Connecticut] were given five consecutive soil applications of dithane D-14 at 1·5 and 0·75 per cent. prior to planting in untreated soil infested with the red stele organism, *Phytophthora fragariae* [*R.A.M.*, 30, p. 525]. The higher concentration gave 100 and the lower 60 per cent. control, while for plants set directly in infested soil, the figures were 70 and 100 per cent. control, respectively. The inferior effect of the higher strength in the latter series is attributed to root injury, which prevented sufficient uptake of the chemical to confer protection. Only 10 per cent. of the plants in untreated soil remained healthy. In a field trial two subsurface applications of the 1·5 per cent. solution completely prevented the spread of red stele from an infested area, both at the time of treatment and during the following year.

Miller (P. W.). **Sensitivity of some species of Fragaria to Strawberry yellows and crinkle virus diseases.**—*Plant Dis. Reptr*, 35, 6, pp. 259–261, 1 fig., 1951. [Multilithed.]

In studies by the United States Department of Agriculture and the Oregon Agricultural Experiment Station, Corvallis, various *Fragaria* species and variants were tested by means of viruliferous aphids [*Capitophorus fragariae*: see next abstract] for differential reaction to strawberry yellows [yellow edge: *R.A.M.*, 30, p. 573] and strawberry crinkle viruses, using the same diseased plants in each case as inoculum. A triploid clone of wild strawberry (*F. vesca*) from Seneca, Oregon [ibid., 30, p. 478], was the most sensitive to yellow edge, and a strain of the same species from Dee the most sensitive to crinkle. On this species crinkle virus causes the youngest leaf to curl downwards 5 to 10 days after inoculation; the older leaves wilt and die soon afterwards and the plant dies 36 to 45 days after inoculation. Yellow edge causes only a general yellowing and slight dwarfing of the leaves on this host. *Fragaria* sp. (P.I. 166069, a *vesca* type from India), *F. chiloensis* [ibid., 30, p. 174], and *F. ovalis* [ibid., 30, p. 524] were all highly tolerant of both viruses.

Miller (P. W.). **Number of aphids and time required for the transmission of Strawberry yellows.**—*Plant Dis. Reptr*, 35, 6, pp. 262–263, 1951. [Multilithed.]

Co-operative experiments carried out during 1950 by the United States Department of Agriculture and the Oregon Agricultural Experiment Station, Corvallis, showed that a single wingless aphid (*Capitophorus fragariae*) [*R.A.M.*, 30, p. 524] may, under greenhouse conditions, acquire strawberry yellows [yellow edge] virus [see preceding abstract] and transmit it to the wild strawberry (East Malling clone of *Fragaria vesca*) after feeding for only one to three hours on an infected strawberry plant. It seems essential, therefore, to control the insect completely in areas where certified plants are propagated and where isolation is not complete, to prevent the spread of yellow edge.

Heim (R.). **Les champignons. Tableaux d'un monde étrange.** [Fungi. Pictures of a strange world.]—143 pp., 6 col. pl., 229 figs., Paris, Éditions Alpina, 1948. [Received July, 1951.] Fr. 1800.

This monograph on fungi (with special reference to the Basidiomycetes) illustrated with reproduction of water-colour paintings by Yvonne Jean-Haffen and photographs by J. Vincent, comprises much interesting information, presented in a semi-popular form, supplemented by a table showing the general classification of fungi, and with keys for the determination of European genera of Basidiomycetes.

List of common names of Indian plant diseases.—*Indian J. agric. Sci.*, 20, 1, pp. 107–142, 1950.

This list of common names of Indian plant diseases, compiled by a sub-committee of the Indian Council of Agricultural Research, contains the names of 279 hosts of economic importance, listed in alphabetical order of their scientific names with common names (English and Indian) wherever possible. The diseases for each host are arranged under the scientific names of the causal organisms in alphabetical order; the common names of the diseases are mostly taken from the List of Common Names of British Plant Diseases [*R.A.M.*, 28, p. 133].

Salmon (S. C.). **Forecasting the occurrence of diseases and insects in Japan.**—*Plant Dis. Reptr*, 35, 6, pp. 251–254, 1951. [Multilithed.]

In connexion with forecasting service for rice blast (*Piricularia oryzae*) in Japan [*R.A.M.*, 30, p. 539] permanent 'prediction fields' are established in each district where the disease is likely to occur. In each field is a highly and a moderately resistant variety and highly susceptible one. Infected straw is scattered and half of each variety fertilized with nitrogen at the normal rate and half at 1·5 times this rate. Although the same varieties are used each year they are not necessarily the same in each Prefecture. The prevalence of blast is determined by examining 25 hills in each plot within 15 ft. of the centre and is expressed as a percentage of the number of necks and stems examined. The number of spots per leaf may also be recorded. Results are correlated with conidia counts, meteorological conditions, the stage of plant development, and prevalence in commercial fields near by. These studies relate mostly to neck blast, but leaf blast is also considered. Forecasts are based largely on spore counts and weather, especially temperature and number of hours of sunshine. A rapid increase in spore count for a week or ten days ending 25 to 30 days before heading, generally precedes heavy infection and much damage. It is therefore important to compare the development previous to heading with that in previous years since delayed growth means greater susceptibility. In the Tohoku region in northern Honshu the time of appearance of the rice head is also important. A delay of more than ten days as compared with the normal indicates heavy damage. Since the most effective period for treating neck blast ranges from ten days before heading to ten days after there is ample time for a forecast before treatment is necessary. The use of an early, specially susceptible Mongolian variety offers some promise of improving forecasts.

Predictions of seed or seedling rot of rice (*Achlya* spp. and *Pythium dissotocum*) [but see ibid., 30, p. 341] are based on the time of seeding as compared with the normal and on meteorological conditions, especially air and water temperatures. Rot is believed to be especially likely to occur when the air temperature rises after prolonged low temperatures. It is particularly dangerous if the water temperature falls to 13° C. for several days. Since damage may occur almost immediately prompt action is necessary to prevent severe losses.

Research relating to forecasting epidemics of stem and stripe [yellow] rust (*Puccinia graminis* [ibid., 15, p. 635] and *P. glumarum* [ibid., 18, p. 734]) of wheat and barley, and leaf rust of wheat (*P. triticina* [ibid., 18, p. 790]) and barley (*P.*

hordei) have been under way for about ten years. Forecasts are based on counts of spores collected in spore traps, meteorological conditions, and plant development. Prediction fields similar to those for rice are established in key positions. In these fields susceptible varieties are sown about ten days earlier than usual and receive 50 per cent. more nitrogen. Rust incidence in autumn, winter, and spring is recorded by reference to standard charts prepared by the United States Department of Agriculture.

The appearance of potato blight (*Phytophthora infestans*) [C.M.I. map No. 109] in southern Japan serves as a warning of possible damage in the north, although generally the correlation is not good enough for prediction [cf. *R.A.M.*, 30, p. 536]. The appearance of blight in Shiguoka Prefecture, however, is a reasonably reliable index of its occurrence about three weeks later in the more northerly and generally higher Nagano Prefecture.

Noble (Mary). **Seed pathology.**—*Nature, Lond.*, 168, 4274, pp. 534–537, 1951.

This is the substance of a paper read before the Botany Section of the British Association meeting held at Edinburgh in August, 1951. The subject is discussed from the agricultural, horticultural, and international aspects, and includes a review of seed testing in relation to pathology.

Parker-Rhodes (A. F.). **The Basidiomycetes of Skokholm Island. V. An elementary theory of anemophilous dissemination. VII. Some floristic and ecological calculations.**—*New Phytol.*, 50, 1, pp. 84–97; 2, pp. 227–243, 4 graphs, 1 map, 1951.

The author explains in general terms a mathematical theory applicable to the dissemination of purely anemophilous species of Basidiomycetes and describes in detail its application to the Gwales Islands, Wales, with particular reference to Skokholm.

In Part VII floristic and ecological data concerning the larger species on Skokholm, collected in September for four consecutive seasons, are presented in tabular form and analysed statistically.

Moore (W. T.) & Mason (B.). **Blender for preparation of mycelial inocula.**—*J. gen. Microbiol.*, 5, 3, pp. 516–518, 1 pl., 1 diag., 1951.

A description is given of the construction of a blender for the preparation of mycelial inocula in amounts varying from 20 to 200 ml., developed at the Butterwick Research Laboratories, Imperial Chemical Industries Ltd., Hertfordshire. The container and cutter assembly can be removed for heat sterilization and a cottonwool gland maintains sterility during blending.

Dingle (J.) & Solomons (G. L.). **A micro-method for the examination of biochemical activities of microorganisms.**—*Nature, Lond.*, 168, 4271, pp. 425–426, 1 fig., 1951.

A description is given of a newly developed technique for examining biochemical activities of micro-organisms at the Research Department, H. W. Carter and Co., Coleford, Gloucestershire. The method consists in growing the organism in a small, sterile, porcelain or glass cylinder, containing 0·1 ml. of an agar medium. Forty cylinders rest on a thin polyvinyl chloride sheet in a Petri dish. With two operators 500 cylinders can be filled in an hour. Five fungi have been inoculated by spore suspensions in one dish with no cross-infection. When the mycelial mat is formed, little drying is observed after ten days' incubation, if this is carried out in a humidity chamber. Growth of twenty different fungi was quite typical and sporulation was not retarded. For estimating the metabolic products formed, a modification of the agar-plate diffusion technique [*R.A.M.*, 30, p. 279] was used. The plugs of agar

are first extruded from the cylinders by means of a glass rod on to a glass sheet. For estimating enzyme activity a suitably buffered 1·5 per cent. agar solution containing the substrate is poured on to a sheet at 48° to 50° C., thus ensuring the formation of a perfect seal around each plug. To prevent further growth during the assay, salicylanilide is included in the assay medium. Antibiotics can be assayed by the usual methods. The technique is also being used successfully for the screening of cultures of micro-fungi.

Guyotjeannin (C.). **L'emploi de colorants basiques pour la coloration d'ascospores de levures en culture sur lame.** [The use of basic dyes for staining yeast ascospores in slide culture.]—*Bull. Soc. mycol. Fr.*, 66, 1, pp. 41–42, 1950.

For staining yeast cultures on gelatin films the author has devised a modification of Vanbreuseghem's method (*Ann. Parasit. hum. comp.*, 22, pp. 235–236, 1947), in which 2 per cent. glucose is added to the bacteriological gelatin. Ascospore production is relatively copious. The dried slide is stained without prior fixation for at least 10 or 15 minutes with Ziehl's fuchsin, then washed in water and in alcohol and water before staining with a 1 per cent. basic aqueous solution of Nile blue hydrochlorate for about 30 seconds. Ascospores are coloured red against a blue background or the colourless vegetative cells. While the chlamydospores of *Candida albicans* stain deeply with basic fuchsin, those of *Torulopsis pulcherrima* turn a darker blue than other yeast-like elements, the double wall of the chlamydospores turning blue. Yeast capsules show up distinctly on gelatin media. Basic Nile blue hydrochlorate gives a clear, light, even colour, and shows up plasmodesmata in filamentous fungi very distinctly.

Gerretsen (F. C.) & Haagsma (Netty). **Occurrence of antifungal substances in Brassica rapa, Brassica oleracea and Beta vulgaris.**—*Nature, Lond.*, 168, 4276, p. 659, 1951.

In studies at the University of Groningen [Holland] antifungal substances were isolated from the storage organs of turnip, kohlrabi, and beet. In the first two the active substances were confined to the superficial cell layers, which would seem to indicate that the plant produces these substances to increase its resistance to microbial invasion. The antifungal substance isolated from turnip, which the authors call 'rapine', was a yellow, oily material with an odour of turnips. Solubility in water was low, but when the substance was mixed with malt agar a concentration of $1:10^5$ prevented growth of different fungi and yeasts. *Trichophyton rosaceum* [*T. roseum*] was readily inhibited. Of the fungi tested *Fusarium oxysporum* was the most susceptible. The active principle from kohlrabi inhibited growth of the same micro-organisms as rapine, but it appeared to be somewhat less active.

From both the cortex and the inner part of beetroots a crude preparation was made which was especially inhibitive against *Fusarium* sp. Further work is in progress.

Stessel (G. J.). **Methods of selecting soil microorganisms that produce antibiotics active against plant pathogens.** —Abs. in *Phytopathology*, 41, 1, p. 33, 1951.

Soil samples were added to a yeast extract glucose medium at dilutions giving 30 to 50 colonies per plate and incubated for four days at 26° C. Dilution plates yielding about 70,000 discrete colonies were sprayed with standardized mixed spore suspensions of four mutually tolerant phytopathogenic fungi. After two days' incubation 170 culturally different organisms producing clear-cut inhibition zones against all the test fungi were isolated. Streak plate cultures of the inhibitory organisms were sprayed separately with suspensions made from each of eight

phytopathogenic fungi and two phytopathogenic bacteria. On the basis of comparative inhibition 21 of the isolates were selected for further study. Culture filtrates were assayed for activity against *Glomerella cingulata* by a modified cylinder plate method. Antibiotic substances were produced by 16 of the organisms in one or more media. Of the 170 original isolates, five reacted satisfactorily to pH, time, and thermostability tests.

Hopf (P. P.) & Race (E.). **Protection of mechanical cloth with phenyl mercurials.** —*Industr. Engng Chem.*, 41, 4, pp. 820–827, 1 fig., 6 graphs, 1949.

The general use in industry of the highly bactericidal and fungicidal phenyl mercurials has been retarded by their low solubility and the consequent difficulty of obtaining uniform applications of sufficient strength on fabrics, as well as by the risk of dermatitis involved in handling. These objections have been overcome by the production at the Ward Blenkinsop Research Laboratories, Shepton Mallet, Somerset, of a phenyl mercuric salt of 2,2′-dinaphthyl methane- 3,3′-disulphonic acid (phenylmercuric fixtan) [*R.A.M.*, 28, p. 378], which goes readily into colloidal solution and the colloid breaks irreversibly when dried on the fibre.

Wood was protected from [unspecified] fungal damage during an incubation period of 84 days by less than 0·001 per cent. of either fixtan or pure phenylmercuric acetate. Both preparations likewise proved equally toxic to *Chaetomium globosum* [ibid., 30, p. 528] on cotton yarn; at 0·0005 per cent. fungal growth and cellulose degradation were very slight, and above this concentration absent. In a test with mixed pure cultures of *C. globosum*, *Myrothecium verrucaria* [ibid., 30, p. 529], *Memnoniella echinata*, *Stachybotrys atra* (all active decomposers of cellulose) [cf. ibid., 29, p. 473], *Aspergillus niger*, *A. amstelodami*, and *Penicillium brevi-compactum* [ibid., 29, p. 323], untreated cotton yarn was completely degraded in 21 days, when irregular colonies appeared on the samples containing 0·0002 and 0·0005 per cent. mercury. At the end of the 84-day incubation period there was sparse fungal growth, consisting mainly of colonies of *A. niger*, on the samples containing 0·01 per cent. A concentration of 0·005 per cent. permitted the development of *P. brevi-compactum*. Independent qualitative tests with these two species showed that the former, under optimum environmental conditions, developed slowly on cotton impregnated with either phenylmercuric acetate or fixtan at a concentration equivalent to 0·017 per cent. mercury, the corresponding level for *P. brevi-compactum* being 0·012 per cent.

Extensive patch tests to ensure that the impregnated fabrics involved no risk in handling were performed with satisfactory results.

Goldberg (A. A.). **Le dinaphtylméthane-disulfonate phényl mercurique (pénotrane), nouveau produit substantif résistant au lavage et protégeant les tissus contre les moisissures.** [Phenylmercuric dinaphthylmethane-disulphonate (penotrane), a new substantive product resistant to washing and protecting tissues against moulds.]—*Chim. et Industr.*, 64, 3 bis, pp. li–liii, 1950.

Information is presented on the industrial applications of phenylmercuric dinaphthylmethane-disulphonate (penotrane) [cf. preceding abstract]. At the Ward Blenkinsop Research Laboratories, Shepton Mallet, Somerset, wood treated with the chemical at a concentration of 0·02 per cent. was entirely immune from attack by *Merulius lacrymans*, *Polyporus divaricatus*, *Chlorosplenium aeruginosum* [*R.A.M.*, 16, p. 3], *P.* [*Poria*] *incrassata*, and *Polyporus* [*Polystictus*] *versicolor*. It has also shown promise in recent plant disease control experiments in England.

The maximum dilutions (expressed in multiples of 1,000) inhibiting the growth on Czapek's agar for a 21-day period of certain fungi pathogenic to man were as follows: *Rhizopus nigricans* [*R. stolonifer*] and *Penicillium expansum* 10, *P. citrinum* and *Aspergillus niger* 9, *P. notatum* and *Monilia* [*Candida*] *albicans* 16, *A. fumigatus* 7, *Microsporum audouini*, *M. lanosum* [*M. canis*], and *Trichophyton mentagrophytes*

24 [cf. ibid., 30, p. 184], and *T. purpureum* [ibid., 28, p. 348] and *Epidermophyton inguinale* [*E. floccosum*: loc. cit.] 50.

Clowes (F. A. L.). **The structure of mycorrhizal roots of Fagus sylvatica.**—*New Phytol.*, 50, 1, pp. 1–16, 5 figs., 1 diag., 4 graphs, 1951.

Studies in the Department of Botany, Oxford University, demonstrated that both the long and short roots of beech may became mycorrhizal [*R.A.M.*, 30, p. 239], although the extent of infection is not constant. Many roots form typical ectotrophic mycorrhiza with a Hartig net either limited to the epidermis or extending into the cortex, where there is a variable amount of intracellular penetration. Others have a typical fungus mantle, but without intercellular hyphae. The evidence from a study of both seedling and tree root systems suggests that infection originates in the colonization of the root surface to form a mantle and that penetration, where it occurs, is secondary. Some of the theories of mycorrhizal nutrition and causal morphology are discussed in the light of anatomical investigation.

Rippel (K.). **Das Virusproblem Kartoffelabbau.** [The virus problem, Potato degeneration.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), 155, pp. 363–367, 1950.

On the basis of his own experiments at the Plant Breeding Institute, Weihenstephan [*R.A.M.*, 30, p. 67], Germany, in conjunction with analogous observations elsewhere the author propounds the following working hypothesis in explanation of the potato degeneration problem. Resistance of the host to degeneration or virus infection, as the case may be, is assumed to be conditioned on the one hand by ecologicophysiological, and on the other by sociologico-microbiological factors. Certain organic compounds of nutritional and biological importance are believed to be concerned in the metabiotic or symbiotic relationship of the soil microflora to the potato plant. Viewed from this angle, potato degeneration acquires the aspect of a cultural or deficiency disease, which would seem to be preventable in a suitable soil containing the appropriate microflora.

McKay (R.) & Clinch (Phyllis E. M.). **Observations on the inheritance of field resistance to leaf roll of Potatoes (Shamrock × Skerry Champion).**—*Sci. Proc. R. Dublin Soc.*, N.S., 25, 17, pp. 225–233, 2 pl., 1951.

Studies were made during 1946, 1947, and 1948 at University College, Dublin, on field resistance to leaf roll [*R.A.M.*, 30, p. 186] in 22 potato seedling units resulting from a cross between Shamrock and Skerry Champion [ibid., 24, p. 243]. The units were planted alternately with Kerr's Pink infected with leaf roll, with Arran Cairn and President as controls, the amount of infection developing in the progeny being recorded in the following year. The controls contracted 100, 50, and 100 per cent. infection in the three years, respectively.

Under the experimental conditions three units remained completely free from infection and four others had less than 50 per cent. However, there was no true immunity as all units succumbed to sprout infection (from the same source) by means of *Myzus persicae*. Variations in symptom expression appeared in the different units, and these can be classified in four broad groups: (1) severe, plants reduced in size and vigour by two-thirds, President type; (2) reduction in size and vigour by one-half to one-third, Kerr's Pink or Majestic type; (3) little or no reduction in size or vigour, only the lower leaves rolled, Great Scot type; (4) no reduction in size or vigour, and only occasional terminal leaflets rolled at the base, Shamrock type.

Wilson (J. D.) & Sleesman (J. P.). **Disease and insect control on Potatoes in Ohio in 1950.**—*Amer. Potato J.*, 28, 6, pp. 632–638, 1951.

In spraying tests on Cobbler potatoes carried out in three localities in Ohio in

1950 dithane D-14 plus zinc sulphate and dithane Z-78 (both plus DDT) gave better control of early and late blights [*Alternaria solani* and *Phytophthora infestans*, respectively: cf. *R.A.M.*, 28, p. 352; 29, p. 639; 30, p. 26] and higher yields (511 and 513 bush. per acre, respectively) than did most of the copper fungicides used (450 to 492 bush.; control 411). Zerlate [ibid., 29, p. 639], methasan [cf. ibid., 24, p. 395], and zac gave fair control of early blight but were comparatively ineffective against late blight. In a parallel experiment at Wooster on later planted Katahdin the dithane D-14 formula gave a yield of 584 bush. per acre, Mn EBD and cop-o-Zink each 569, parzate and methasan each 557 (all were combined with DDT), Bordeaux mixture 473, and the control 428. Foliage mortality was 15 per cent. for dithane, parzate, and MnEBD, compared with 80 on the unsprayed.

MÜLLER (K. O.). **Über die Herkunft der W-Sorten, ihre Entwicklungsgeschichte und ihre bisherige Nutzung in der praktischen Kartoffelzüchtung.** [On the origin of the W-varieties, their development and their previous use in practical breeding.]—*Z. PflZücht.*, 29, 3, pp. 366–387, 1 fig., 1951.

Most of this detailed information on the 'W' potato varieties, resistant to *Phytophthora infestans* (biotype A) [*R.A.M.*, 21, p. 217], their development from Broili's Ef strain, and their part in the production of blight- and virus-resistant varieties has already been noticed [ibid., 7, p. 665; 13, p. 53; 14, p. 390; 28, p. 414; 29, p. 638; 30, p. 241, *et passim*].

HARTMAN (R. E.). **Potato wart in America.**—*Plant Dis. Reptr*, 35, 6, pp. 268–271, 1951. [Multilithed.]

The author traces the spread of potato wart disease (*Synchytrium endobioticum*) in the United States and summarizes the results of investigations on the disease in Pennsylvania [*R.A.M.*, 24, p. 114] up to 1950. He describes the progress of wart eradication since 1932 and the various methods employed. In 1947 mechanical equipment was supplied and many properties were ploughed up. Ammonium thiocyanate applied at the rate of 2,500 lb. per acre to old infections eradicates the disease provided the organic content of the soil is diminished by cropping, but the standard treatment now used is finely pulverized copper sulphate at 2,500 lb. per acre or 5 per cent. solution of 40 per cent. formaldehyde at 20 gals. per sq. ft. or a combination of both treatments. The efficacy of the treatment is tested by growing susceptible Russet Rural potatoes. By the end of 1950 wart had been eradicated completely from 440 infected gardens, 333 had been treated and were undergoing test planting, and the balance of 340 in 11 remaining infected villages is to be treated during the period 1951 to 1957.

The results of tests since 1943 of new varieties [ibid., 29, p. 637; 30, pp. 189, 242] have shown that Warba, Calrose, Ontario, Pawnee, Kennebec, Chisago, and Red Warba are immune and Houma [but see ibid., 29, p. 638; 30, p. 70], Kosota, Menominee, Teton, La Salle, Empire, Chenango, Essex, Marygold, Pontiac, Satapa, Russet Sebago, Canus, Progress, Waseca, White Pontiac, and Dakota Chief are susceptible.

SUMMERS (E. M.). **'Ishuku-byo' (dwarf) of Sweet Potato in the Ryukyu Islands.**—*Plant Dis. Reptr*, 35, 6, pp. 266–267, 2 figs., 1951. [Multilithed.]

An apparently new and extremely virulent virus disease called 'ishuku-byo' or dwarf has appeared in sweet potatoes in the Ryukyu Islands, Japan, since 1945 and is now present over large areas throughout. No edible tubers are produced on diseased vines. The incubation period is said to be 70 to 120 days. There is excessive proliferation of young shoots from the leaf axils and dwarfing of subsequent growth. Little or no latex is present in diseased plants. None of the varieties grown on the Islands is immune or even resistant. The introduction of the disease into

Japan seems inevitable, unless the utmost caution is exercised, and might prove a major disaster. The reaction of all Japanese varieties to the disease should be determined in the Islands and resistant varieties, if any, used in future breeding programmes to provide a practical control even though the disease should never be introduced.

HASHIOKA (Y.). **Studies on the mechanism of prevalence of the Rice blast disease in the tropics.**—*Tech. Bull. Taiwan agric. Res. Inst.* 8, 237 pp., 14 figs., 14 graphs, 1 map, 1950.

Many of the contributions listed in the 11-page bibliography appended to this exhaustive, fully documented and tabulated survey (the result of a ten-year study in Formosa) of the available information on the prevalence of rice blast (*Piricularia oryzae*) in the tropics have already been noticed from other sources [*R.A.M.*, 30, pp. 190, 539, and above, p. 620]. The following are among the aspects under which the subject is treated: analysis of tropical environments in relation to the rice crop, with special reference to the prevalence of blast of the foliage [loc. cit.]; relation of tropical environments to (*a*) the growth of the pathogen and (*b*) the resistance of the host to the disease; relation of age of the plant to resistance; the inherent resistance of tropical varieties; and control of the disease in the tropics.

TWYMAN (E. S.). **The iron and manganese requirements of plants.**—*New Phytol.*, 50, 2, pp. 210–226, 1951.

The results of investigations into the iron and manganese requirements of oat, lettuce, and tomato plants [*R.A.M.*, 30, p. 430] grown in water cultures in the Department of Botany, Birmingham University, showed that those receiving both iron and manganese in low concentrations are always chlorotic and small. Those supplied with adequate manganese and low iron are usually more chlorotic than the foregoing. It is suggested that manganese competes with the available iron for reaction with the active iron acceptors, forming stable inactive metabolites, thus intensifying the chlorosis and causing both minerals to accumulate in an inactive form.

Under conditions of high manganese and adequate iron the intensity of the chlorosis is determined by the manganese concentration in the medium. This toxicity chlorosis may be due to competition between each mineral for the active iron acceptors, antagonism between them, whereby manganese in high concentrations in the medium may retard the entry of iron, thus encouraging the formation of inactive iron acceptors. Alternatively the manganese may exert a direct toxic action on processes concerned in iron metabolism.

Manganese deficiency develops in plants supplied with low manganese and adequate iron owing to the small amounts accumulated in the tissues. This is aggravated by frequent changes of culture solution, a procedure which may prevent the complete absorption of the available manganese in the medium because of the antagonistic influence of the iron. The total quantity of manganese in the plants and the time of symptom appearance is therefore determined to some extent by the external iron concentration.

GARRETT (S. D.). **Ecological groups of soil fungi : a survey of substrate relationships.**—*New Phytol.*, 50, 2, pp. 149–166, 1951.

The relation of the growth habits of soil fungi to the type and distribution of utilizable substrates is discussed followed by a consideration of ecological groups in relation to various cultural isolation methods [*R.A.M.*, 29, pp. 330, 432, 530]. An ecological group of soil fungi is defined as a collection of species characterized by some peculiar advantage for pioneer colonization of a particular medium. The examples discussed are the saprophytic sugar fungi, root inhabitors [ibid., 29,

p. 420], lignin-decomposing, coprophilous, and predaceous fungi. The ecological determinant may be either a peculiar physiological or biochemical ability or merely an extreme development of some physiologic mechanism common to all fungi.

An attempt is made to correlate the fungal growth habit of the saprophytic sugar fungi, root-inhabitors, and lignin-decomposers with the type and distribution of substrate. The first group, exemplified by the Phycomycetes, is characterized by rapid growth in the presence of a suitable substrate, followed by a period of quiescence, and it is suggested that the substrate comes to the dormant fungus at least as often as the active fungus makes contact with fresh material by mycelial growth through the soil.

The development of the mycelial strand and the rhizomorph amongst root-inhabiting fungi is related to the occurrence of substrata of indefinite extent awaiting invasion, and with the need for the concentration of fungus reserves at the point of invasion to overcome active and passive host resistance. For both the progressive ectotrophic invasion of a single root and of a second root not in immediate contact with the first, nutrients must be translocated from the region already infected to the points of new invasion. The low surface/volume ratio of the mycelial strand and the rhizomorph indicates that these organs are primarily concerned with the translocation rather than with the absorption. Attention is drawn to the analogy between the rhizomorph and the sclerotium. Evidence for the control of their formation by a similar physiological mechanism is presented. The development of the mycelial strand and the rhizomorph amongst lignin-decomposing fungi, such as many of the higher basidiomycetes, is correlated with the distribution in suitable habitats of abundant lignin substrates and with the need for translocation of nutrients for the development of a hyphal absorbing system.

Non-selective cultural isolation methods for soil fungi are examined for evidence of selectivity. All methods hitherto employed, in so far as a sugar is used as the chief carbon source in the nutrient agar, tend to favour saprophytic sugar fungi, but in some methods the advantage thus afforded to this group is much greater than in others. Nevertheless, a comparison of results obtained by these various methods has yielded valuable ecological information, and it is suggested that the development of a greater range of selective methods would be more useful than continuing the search for the ideal non-selective method.

Diseases of Cumin and Fennel.—*Plant Prot. Bull., New Delhi*, 1, 2–3, pp. 28–30, 1949–1950.

Information is presented in popular form on the distribution in India, economic importance, symptomatology, and control of cumin [*Cuminum cyminum*] powdery mildew (*Erysiphe polygoni*) [*R.A.M.*, 15, p. 682], blight (*Alternaria burnsii*), and wilt (? *Fusarium* sp.), and blight of fennel [*Foeniculum vulgare*] (*Cercospora foeniculi*). [ibid., 9, p. 613; 17, p. 771].

E. polygoni, which develops most rapidly at a temperature range of 80° to 90° F., has been effectively combated on cumin in Bombay by one or two applications of sulphur dust at the rate of some 35 lb. per acre.

The first symptoms of blight appear on cumin in the form of minute, whitish, necrotic areas, later turning from purple through brown to black, when the crop is about two months old in mid-January. All the aerial organs are destroyed, the damage being particularly noticeable on the succulent leaves and flowers. *A. burnsii* can over-summer in plant residues in the field and is probably perpetuated also through the seed.

The cumin crop in Ajmer-Merwara sustained heavy damage in February and March, 1949, the average incidence of which ranged from 25 to 40 per cent. with a maximum of 75. The pink sporodochia of a *Fusarium*, probably not the same as

the species recorded from Bulgaria [ibid., 15, p. 683], were detected on some of the roots. In 1935–6 *Macrophomina phaseoli* was isolated for the first time from wilted cumin plants in Madras. This serious and widespread disease merits immediate investigation.

The epidemiology and life-history of *C. foeniculi* [ibid., 17, p. 771] on fennel also call for study. The disease was responsible for very severe injury, simulating burning, to the crop in Ajmer-Merwara in March, 1948.

Darley (E. F.) & Flores (M. A.). **Two cankers of Cinchona in Guatemala caused by Phytophthora cinnamomi and P. parasitica.**—*Phytopathology*, 41, 7, pp. 641–647, 2 figs., 1951.

The results of isolation and inoculation studies at the National Institute of Agriculture and Stock, Guatemala City, showed that stripe canker and girdle canker, two distinct diseases of *Cinchona* bark, causing heavy losses in some plantations, are due, respectively, to *Phytophthora cinnamomi* [*R.A.M.*, 27, p. 255] and *P. parasitica* [ibid., 30, p. 388]. The former attacked all the clones tested, of which only one, Z–15, displayed a measure of resistance. Physiologic strains are apparently concerned.

Angell (H. R.) & Hills (K. L.). **Seedling blight. III. Control of seedling blight of Opium Poppy by liming.**—*J. Aust. Inst. agric. Sci.*, 17, 1, pp. 17–24, 1 fig., 1951.

In further studies on seedling blight in Australia [*R.A.M.*, 30, p. 192], poppy (*Papaver somniferum*) seeds were experimentally inoculated with two species of *Pythium*, both isolated from poppy and from peas, by pouring over the sown seed a suspension of the macerated fungus in water. Fungicidal seed dressings entirely failed to control seedling blight in sterilized soil, though there was a full stand of healthy seedlings in limed soil sown at the same time. All four isolates were pathogenic to poppy. Farmyard manure or a complete nutrient solution did not reduce seedling blight in potted soil. Adequate control did, however, result both in the greenhouse and the field when lime was added to the soil. In the field experiment lime distributed along the rows at the rate of 56 lb. per acre or worked into the soil before seeding at 1,060 lb. per acre gave, respectively, 17·5 and 26·5 seedlings per foot of row after six weeks, as against 13·3 in the unlimed rows.

Rochelmeyer (H.). **Die Systematik der Clavicipiteae und ihre Bedeutung für die Gewinnung von Mutterkorn.** [The taxonomy of the *Claviceps* group and its significance in relation to the production of ergot.]—*Pharmazie, Berl.*, 4, 7, pp., 326–333, 15 figs., 5 graphs, 1949.

On the basis of 14 contributions to the relevant literature the author presents a useful summary of the information on the taxonomy of the *Claviceps* group in relation to ergot production from rye and other Gramineae by *Claviceps purpurea* [see above, p. 606] and seven other European and 11 American species, which are listed with brief notes on their distinguishing characters.

Chona (B. L.) & Rafay (S. A.). **Studies on the Sugarcane diseases in India. I. Sugarcane mosaic virus. II. The phenomena of natural transmission and recovery from mosaic of Sugarcane.**—*Indian J. agric. Sci.*, 20, 1, pp. 39–68; 69–78, 1 col. pl., 1950.

Five years' studies at the Imperial Agricultural Research Institute (now the Indian Agricultural Research Institute), New Delhi, on the sugar-cane mosaic virus [cf. *R.A.M.*, 15, p. 398; 24, p. 339] and the factors influencing its virulence in the juice extracted from affected plants showed that there are three strains. Judging from the symptom picture the Indian strains resemble virus IB of Summers [ibid., 28, p. 310; 30, p. 545]. The thermal death point of strain X in expressed

juice is 65° C., that of Y 55° [cf. ibid., 29, p. 478], and that of Z 45°; X and Y are able to withstand a dilution of 1:100 and can remain viable for six hours at 30° to 32°, whereas Z cannot withstand a dilution of more than 1:50 and hardly survives for two hours at 30° to 32°. These strains are not filterable through a Chamberland L, Berkefeld (V), or Seitz filter, and even filtrate (amber colour) through ordinary filter-paper is non-infectious. The virus can be centrifuged for half an hour at 3,000 r.p.m. without sustaining appreciable loss of virulence, though further centrifuging reduces its infectivity. *In vitro* the virus loses viability in a few hours at room temperature (30° to 32°), but at 5° to 6° it can remain viable for eight days in the extracted juice; affected leaves stored at 5° to 6° contain active virus after 15 days' storage. Storage temperature is the most important factor in the longevity *in vitro* of the virus. The optimum temperature for artificial transmission is about 32° to 35° [cf. ibid., 28, p. 488]. With Matz's method [ibid., 29, p. 121] successful inoculations could be obtained only in May and June, which in northern India are exceedingly hot and dry. In July and August the humidity is much higher, and the evidence suggests that this factor interferes with successful infection [cf. ibid., 27, p. 157]. Failure of infection during winter, in spite of humidity being low, was demonstrated to be due to unfavourable temperature conditions.

Virus from sugar-cane readily infects maize [cf. ibid., 29, p. 256] and sorghum [loc. cit.]; after passing through these hosts it is still virulent on cane. It is not seed-transmissible and is sensitive to even weak concentrations of alcohol. Infected cane leaves average 20 per cent. less chlorophyll than corresponding healthy ones in June, but after the monsoon the difference decreases and by October both healthy and mosaic leaves contain almost equal amounts of chlorophyll. Old affected leaves from which symptoms have disappeared contain some viable virus. Age of the plant has no effect on virulence.

Some of the setts from affected canes may be healthy. The amount of recovery varies with the variety, place, and year in the same variety. Natural transmission is either absent in northern India or it occurs only to a slight extent, except in a few small submontane localities. The insect vector in India has not yet been determined.

Rafay (S. A.). **Another strain of Physalospora tucumanensis.**—*Curr. Sci.*, 19, 12, pp. 385–386, 1950.

At the Central Sugar-Cane Research Station, Pusa, Bihar, India, some further types of the sugar-cane red rot fungus (*Physalospora tucumanensis*) [*R.A.M.*, 29, p. 477] were isolated from heavily infected material of the Co. 453 variety, which had maintained until the opening of the 1949–50 season its resistance to the three types already recognized. The cultural characters of five prominent new types are described as follows. The texture of type D mycelium is loose and sparse, the slimy masses of conidia covering half or more of the colony surface and filling the concentric depressions in it. The number of acervuli on the cane exceeds that produced by other types. The profuse aerial mycelium of type E is of velvety texture; conidial production is scanty, covering about a quarter of the surface of the substratum. The cottony mycelium of type F turns grey with age, while the conidial masses, dark grey at first, assume a pink tinge. Type G has an abundant, dark, grey mycelium, and meagre conidial production. The mycelium of type H is loose and silky and during the first fortnight almost translucent, with abundant, dark pseudopycnidia and masses of conidia on the surface.

Co. 453 reacted as follows to inoculation with the five types. After 30 days the linear spread of infection of D was 27·7 in. and the number of internodes attacked 5·4, the corresponding figures for E being 17·9 and 3·6, for F 12 and 3, for G 11·3 and 2·3, and H 11·8 and 2·5, respectively. On this basis D is distinguished as a new strain; F, G, and H are closely allied to B, while E appears to be an intermediate

form. Fifteen varieties inoculated with type D were graded in four main classes according to the linear spread in a month. Class I (resistant) was represented by B.O.15, in which infection is confined to the inoculated internode and linear spread is 6 in. or less. To class II belong B.O.17, B.O.10, B.O.25, and B.O.11; infection is restricted to the inoculated and adjacent internodes, with a linear spread of 6 to 12 in. In the susceptible class III, with five or six internodes involved and the linear spread from 12 to 20 in., are Co.313, CoK30, CoK29, Co.313, Co.513, and B.O.27. In the highly susceptible class IV linear spread exceeds 20 in.; it includes Co.557, Co.331, Co.299, Co.453, Co.622, B.O.24, and B.O.3.

Dupias (G.). **Contribution à l'étude de la flora urédinologique du Sud-Ouest et des Pyrénées. (3e note.)** [Contribution to the study of the Uredinales of the South-West and the Pyrenees. (3rd note.)]—*Bull. Soc. mycol. Fr.*, 67, 1, pp. 50–64, 1951.

This list of Uredinales collected in south-western France and the Pyrenees includes *Puccinia antirrhini* on *Antirrhinum majus* [*R.A.M.*, 13, p. 269; 14, pp. 239, 645], *P. graminis* [ibid., 26, pp. 195, 290] on *Poa annua*, *Bromus arvensis*, *Festuca pratensis*, *Agrostis alba*, *Elymus europaeus*, and *Agropyrum* [*Agropyron*] *caninum*, and *P.* [*Cumminsiella*] *mirabilissima* on *Mahonia aquifolium* [ibid., 11, p. 581; 26, p. 469]. The fungi listed are arranged in groups according to the altitude at which they were found.

Bouriquet (G.). **Les maladies des plantes et la végétation à Madagascar.** [The diseases of plants and the vegetation in Madagascar.]—*Rev. Bot. appl.*, 31, 341–342, pp. 213–226, 1 fig., 1951.

In this account of plant diseases in Madagascar [cf. *R.A.M.*, 27, p. 79] mention is made of the following new records: *Phytophthora parasitica* on *Antirrhinum* and *Clarkia*, *Pseudoperonospora cubensis* on melon, *Gibberella saubinetii* [*G. zeae*] on wheat, and *Coryneum beijerinckii* [*Clasterosporium carpophilum*] on peach.

Goldie-Smith (E. Kathleen). **A new species of Sorodiscus on Pythium.**—*J. Elisha Mitchell sci. Soc.*, 67, 1, pp. 108–121, 2 pl., 1951.

Sorodiscus cokeri n.sp., parasitizing *Pythium proliferum* in soil from Florida and South Carolina, is the first member of the genus in which zoosporangia have been observed and the first to be found parasitic on fungi. The plasmodia develop mainly in the host sporangia, causing little or no hypertrophy. Exit papillae are formed only by some of the sporangia (which are 5·3 to 8·8 μ in diameter) on the periphery of the sorus. The zoospores developed within the sorus escape through narrow pores formed in contiguous walls, passing from one sporangium to another and so to the outside. The organism is characterized by its cystori, composed of one-layered disks of resting spores, 3·1 to 4·1 μ in diameter. Experimental inoculations of *P. irregulare*, *P. undulatum*, and *P. elongatum* gave positive results.

Van Hell (W. F.) & Veenstra (H.). **Voorlopige resultaten van een tweetal proeven ter bestrijding van de blisterblight-ziekte in gesnoeide Theetuinen.** [Preliminary results of two experiments in the control of the blister blight disease in pruned Tea gardens.]—*Arch. Theecult. Ned.-Ind.*, 17, 2, pp. 78–111, 1 diag., 6 graphs, 1950. [English summary.]

A detailed, fully tabulated account is given of control experiments on blister blight (*Exobasidium vexans*) in two previously pruned Java tea gardens [*R.A.M.*, 30, p. 82], situated at an altitude of some 900 m. above sea-level. At Bah Butong six copper- and six non-copper-containing fungicides, all supplemented by 0·05 per cent. Stanvac Spreader A, were applied by means of the 'Saval' knapsack sprayer [ibid., 30, p. 197] over the period from 11th October, 1949, to 10th January,

1950. The average percentages of leaf infection were lower in all the sprayed than in the untreated plots, the copper-containing preparations being generally more efficacious than those without copper. In the former group were aacodule [or aacoduul: ibid., 29, p. 519], perenox (both at 0·3 per cent.) [ibid., 30, p. 586], Bordeaux mixture (1 per cent.), koneprox, shell copper fungicide (both copper oxychloride), and Tennessee tribasic (copper sulphate), all at 0·5 per cent. In the latter group were tripomol (thiram) at 0·8 per cent., triscabol (ziram), trifungol (ferbam), both at 0·25 per cent., aaventa (chlorophenyl mercury chloroglucine), spergon, and phygon (all at 0·1 per cent.). The average percentages of infection over the last ten weeks of the spraying period in the plots sprayed with the copper- and non-copper-containing preparations (omitting spergon and phygon) were 6·4 and 12·7, respectively, as compared with 22·1 in the untreated, and the leaf yields 13,623, 12,486, and 7,994 gm. respectively. During the month after the conclusion of treatment the corresponding figures were 4·1, 6·8, and 12·5 per cent. infection, and 8,251, 6,472, and 3,849 gm. leaf yields.

The test at Sidamanik was intended to afford guidance as to the optimum fungicide concentrations for the prevention and limitation of blister blight on low-pruned bushes. The following provisional conclusions are drawn from a visual inspection only. Spraying with 0·2 per cent. copper Sandoz or 0·4 per cent. koneprox, both supplemented by 0·05 per cent. Stanvac Spreader A, may be effectively carried out during the critical period for blister blight development from the end of September to early December, commencing just before the buds begin to swell and continuing until shortly after the tip stage. Care should be taken to cover the bud stalks and thoroughly to moisten all sides of the frames with the fungicide.

Koch (L. W.) & Stover (R. H.). **Tobacco diseases and the present status of their investigation in Canada.**—*Lighter* (*Dep. Agric., Can.*), 21, 1, pp. 10–15, 1951. [Mimeographed.]

During the past five years the relative importance of many tobacco diseases in Canada has changed considerably. Between 1938, when blue mould (*Peronospora tabacum*) [*P. tabacina*: *R.A.M.*, 29, p. 203; 30, p. 451] first appeared in Ontario, and 1945, when it became epidemic, various methods in experimental use in the south were tested under Ontario conditions. It then became apparent that thorough spraying with ferbam [loc. cit. and ibid., 26, pp. 268, 333, 347; 28, p. 313; 29, p. 221] every five to seven days gave satisfactory control under optimum conditions of infection if carried out before the seed-bed was infected. Dusting was less effective but more expedient. By 1947 approximately 95 per cent. of all Ontario tobacco growers were applying one of the proprietary carbamates. One feature in which the occurrence of blue mould in Ontario differs from that in the United States is its widespread incidence in July; the explanation is that July air temperatures in Ontario are lower, on the average, than those in more southerly areas, and often lie within the more favourable range for activity of the fungus.

Black root rot (*Thielaviopsis basicola*) [ibid., 29, p. 437; 30, p. 508] continues to be the most important disease in the tobacco-growing areas of Ontario and Quebec. The solution of the problem lies in the development of resistant varieties [loc. cit. and ibid., 30, p. 589], and so far as the Burley tobacco industry is concerned, the disease has become of minor importance since their introduction. Losses in the New Tobacco Belt of Ontario, however, have gradually increased during the past ten years or more. During such years as 1945 and 1950, when average soil temperatures were below normal in June and July (by more than 7° and 5° F., respectively), losses probably amounted to over $2,000,000 annually.

About five years ago a marked change was observed in the nature and incidence of virus diseases on Burley tobacco in the Old Belt of Ontario. Until then there had been only occasional instances of common mosaic [tobacco mosaic virus: ibid.,

23, p. 3; 29, p. 437; 30, p. 589], ring spot [ibid., 4, p. 572], streak [ibid., 22, p. 375], and cucumber mosaic virus [ibid., 21, p. 506; 23, p. 3]. Rather suddenly a marked increase, causing variable but extensive leaf chlorosis, became apparent throughout the Burley districts. On the whole the incidence of such viruses has increased annually until at present it is so high in the Old Belt that a general lowering of leaf quality has resulted in many districts. The major increase in this type of virus infection in the Ontario Burley crop coincided closely with increase in the populations of *Myzus persicae*, which was known to have migrated northwards about that time through the tobacco-growing areas of the United States and reached the Canadian tobacco fields.

Fulton (R. W.). **Superinfection by strains of Tobacco mosaic virus.**—*Phytopathology*, 41, 7, pp. 578–592, 2 figs., 1 diag., 1951.

Out of eight strains of tobacco mosaic virus used at the Wisconsin Agricultural Experiment Station for the inoculation of *Nicotiana sylvestris* leaves already infected by any one of 18 mosaic-type strains of the same virus [*R.A.M.*, 13, p. 648], six (all necrotic types) induced scanty and belated superinfection exclusively in the dark green tissues, the virus content of which was relatively low. Strain C was obtained from Dr. J. Johnson, who characterized it as 'mild' [ibid., 17, p. 200], D (aucuba) had been previously received from Dr. L. O. Kunkel, E, G, and H were isolated from field tobacco, and F from a yellow patch on a leaf of *N. sylvestris* infected by Johnson's 'severe' strain A [loc. cit.].

Strains C and H superinfected readily, causing necrosis of healthy tissue with relatively little virus increase, whereas D, E, F, and G, which were slower to superinfect, multiplied more freely in the sound tissue before necrosis developed. Thus, 48 hours after inoculation the average numbers of lesions per half leaf of tobacco × *N. glutinosa* hybrid produced by standard samples of leaves previously inoculated with strains C and H were only 25 and 28, respectively, as compared with 181, 158, 174, and 216 for D, E, F, and G, respectively. Apparently the dark green areas of mosaic leaves contain enough constituents unused by the mosaic-type strain to allow some multiplication of an introduced strain. The inoculation of mosaic leaves with mosaic-type strains of the virus did not increase resistance to superinfection by necrotic-type strains. Hence it was concluded that there were no virus-free cells in the mosaic leaves, and that the lesions resulted from the multiplication of the necrotic-type strain in cells already harbouring a mosaic-type strain.

The amount of superinfection of mosaic leaves and infection of healthy foliage was influenced to about the same degree by the use of a carborundum abrasive, variations in illumination [ibid., 28, p. 208], and the application of a virus inactivator in the form of a clarified extract of *Phytolacca americana* leaves.

Weber (P. V. V.). **Inheritance of a necrotic-lesion reaction to a mild strain of Tobacco mosaic virus.**—*Phytopathology*, 41, 7, pp. 593–609, 3 figs., 1951.

In studies at the University of Wisconsin the necrotic local lesion reaction of *Nicotiana sylvestris* [see preceding abstract], Clayton's TL106, and Daruma and several other tobacco varieties to the mild or attenuated green mosaic strain of tobacco mosaic virus was incompletely dominant in the F_1 over the systemic mottling response of varieties of the Havana Seed type [cf. *R.A.M.*, 17, p. 417 *et passim*]. A single pair of incompletely dominant factors governed the necrotic reactions of TL106 and Daruma to the mild strain. Probably the same gene pair also determines the response of these and similarly reacting hosts to other strains of tobacco mosaic virus, e.g., the mild yellow (aucuba).

From crossing with *N. alata* it appeared that the necrotic local lesion reaction of *N. longiflora* to the mild strain was controlled by a single pair of dominant factors.

The results of a cross involving both the n^s n^s genes (incompletely dominant alleles of the *nn* genes for the complete systemic mottling reaction) of Daruma and the *NN* genes of Holmes's Samsoun [ibid., 16, p. 417] indicated that the latter are the dominant alleles of the former. The existence of a series of multiple alleles, comprising at least *NN*, n^sn^s, and *nn*, is therefore postulated.

Johnson (J.). **Tobacco mosaic virus mutation.**—*Science*, 114, 2957, pp. 239–240, 1951.

Attempts were made at the University of Wisconsin, Madison, to determine the number of green strains of tobacco mosaic virus [*R.A.M.*, 30, p. 589], already known to be very low. At least eight, free from contamination with yellow strains, were obtained on the basis of no local lesions being produced on *Nicotiana sylvestris*. Many of the plants were grown in the greenhouse for three months under optimum conditions for the development of yellow strains and to the 15 to 20 leaf stage without the appearance of yellow mutations. Yellow spots may be easily misinterpreted owing to interference phenomena and environmental conditions. Altogether these factors may yield an infinite variety of symptoms within fairly restricted boundaries, beyond which, however, further variation is not to be expected.

The results established that mixtures of green and yellow strains may readily be separated; green strains, when completely free from yellow, yielded no yellow spots; and yellow areas very similar to those reported as 'mutations' may be produced by using certain mixtures of known yellow and green strains under controlled environmental conditions. New yellow isolates are similar to those strains already known, of which only five were encountered in these studies. No evidence of mutation was secured.

Newton (N.). **Some effects of high intensity ultrasound on Tobacco mosaic virus.**—*Science*, 114, 2955, pp. 185–186, 1 fig., 1951.

This is a report of experiments at the Battelle Memorial Institute, Columbus, Ohio, on the effects of high-intensity ultrasonic vibrations produced at a frequency of 7 megacycles, much higher than that used in previous ultrasonic exposure of viruses, on tobacco mosaic virus [*R.A.M.*, 25, p. 583]. A purified extract of the virus from Turkish tobacco plants, which consisted of a suspension of virus particles 280 mμ long, was subjected to the maximum energy output of the oscillator. Subsequent electron micrographs showed the highly fragmented virus particles to be 20 to 40 mμ long. Heating of the virus suspension by ultrasonic energy was insufficient in itself to inactivate the virus. In tests on the leaves of Scotia bean [*Phaseolus vulgaris*] plants with unexposed virus and virus exposed to ultrasound for 3·3 minutes, infectivity of the latter was reduced by 95 per cent. as determined from the lesion counts. Lower intensity levels, between approximately 140 and 180 w. power input, and of varying time of exposure, showed that the ultrasonic irradiation of 'aged' virus suspension produces an increase in virus infectivity through dispersion of aggregated clusters of particles into rods 280 mμ long.

Vidali (A.) & Ciferri (R.). **Esperienze di lotta contro l'oidio del Tabacco (Erysiphe cichoracearum) a mezzo di tiosolfato e sali di litio.** [Experiments on the control of Tobacco mildew (*Erysiphe cichoracearum*) by means of thiosulphate and salts of lithium.]—*Tabacco*, 55, 620, pp. 95–102, 1951.

Experiments are described in which potted Burley tobacco seedlings growing in a glasshouse at the Cryptogamic Laboratory, Pavia, were treated preventively against *Erysiphe cichoracearum* [*R.A.M.*, 30, p. 348] by sprinkling the soil with 500 ml. sodium thiosulphate or lithium carbonate [cf. ibid., 30, p. 316] at various

concentrations as soon as the plants had recovered from transplanting, again on the day they were inoculated by spraying with a conidial suspension, and finally three days later. Curative applications were made 20 days after inoculation, lithium carbonate being sprinkled on the soil three times at intervals of three days, while a single spray of sodium thiosulphate was applied on 20th day after inoculation.

The results showed that sodium thiosulphate was effective only when used curatively at concentrations of 1·5 and 2 per cent., but it caused severe burning. Lithium carbonate applied preventively in saturated and semi-saturated aqueous solutions (approximately 1·37 and 0·685 per cent., respectively) was very effective, the saturated solution giving a final disease rating 30 days after infection of 22 [ibid., 29, p. 59] as against 337 for the untreated controls. Used curatively it was not effective.

DEEMS (R. E.). **Trichothecium fruit rot of glasshouse Tomatoes.**—*Phytopathology*, 41, 7, pp. 633–640, 3 figs., 1951.

A fruit rot of glasshouse tomatoes, unlikely to assume economic importance except under abnormally cool and moist conditions, is reported from Ohio. The causal organism was identified as *Trichothecium roseum* and the first symptom is a light brown lesion, usually situated near the stylar end, from which infection tends to radiate, often involving the whole fruit. The firm, dark brown rot caused by *T. roseum* is generally supplemented in nature by a soft, watery, dark brown to black type of decay due to secondary invaders. At an advanced stage the fruit develops a discoid orange-pink coloration with a powdery texture associated with the sporulation of the fungus. In the light of evidence here presented primary infection occurs exclusively as a sequel to fruit injury. Experimental results further indicated that *T. roseum* may induce blossom blight under favourable environmental conditions. Inoculation tests on apple, banana, orange, peach, pear, and quince demonstrated the similarity of the tomato pathogen to the strains found on other hosts [cf. *R.A.M.*, 1, p. 25; 9, p. 628; 12, p. 39, *et passim*].

WILSON (J. D.). **Fungicides for controlling Tomato late blight.**—*Ohio Fm Home Res.*, 36, 268, pp. 6–7, 2 figs., 1951.

During August and September, 1950, late blight [*Phytophthora infestans*: *R.A.M.*, 30, pp. 451, 493] attacked tomatoes at Ohio Experiment Station, Wooster, with almost unprecedented severity. Of the ten materials (of 40 tested) which gave the best control, by spraying at intervals of ten days, nine contained copper. The best was a mixture of COC-S [copper oxychloride sulphate: ibid., 30, p. 26] and p.e.p.s. [ibid., 30, p. 592] (4–½–100), which reduced infection from 87·5 per cent. in the untreated to 2·2 per cent., the yields of disease-free fruit being 32·9 tons per acre, as against 5·9 tons.

CICCARONE (A.) & CARILLI (A.). **Nota preliminare sulle osservazioni attualmente in corso intorno ad alcuni avvizzimenti del Pomodoro, con qualche cenno sull' azione concomitante de un eriofide : Vasates destructor (K.).** [A preliminary note on current observations concerning Tomato wilts, with notes on the concomitant action of an eriophid: *Vasates destructor* (K.).]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 7 (*1949*), pp. 131–157, 11 figs., 1951. [English summary.]

A description is given of a tomato wilt widespread in southern and central Italy, especially in the province of Salerno and in Sardinia, chiefly affecting the varieties San Marzano, Fiaschello, and Lampadino. The wilt develops from July onwards when the third cluster is about to colour. The disorder is attributed to climatic factors, adverse agronomical practices, and damage by various animal pests. Important leaf parasites are *Oidiopsis sicula* [*Leveillula taurica*] and *Alternaria*

solani [*R.A.M.*, 13, p. 65], and the chief systemic parasites *Fusarium bulbigenum* [var.] *lycopersici* [ibid., 21, p. 543] and *Verticillium albo-atrum* [ibid., 10, p. 150].

In tests carried out during 1949 and 1950 in various parts of Italy with varieties especially resistant to *Fusarium* and *Verticillium*, Riverside [ibid., 30, p. 138], Long-red, Gem, Red Plum, Early S. Clara, Pearson, and Pan America gave promising results. Southland [loc. cit.] was resistant to *A. solani* and *Phytophthora infestans*.

Higdon (R. J.). **The control of Pecan scab by fungicides.**—*Plant Dis. Reptr*, 35, 6, pp. 272–273, 1951. [Multilithed.]

In spraying experiments near Batesburg, South Carolina, Bordeaux mixture (4–1–100 for the first application and 6–2–100 afterwards), the same for the first two applications followed by ziram (2–100) for the later ones, and orthocide 406 (N-trichloro-methylic tetrahydrophthalimide) at 4–100 all controlled pecan scab (*Cladosporium effusum*) [*R.A.M.*, 29, p. 281] on the susceptible Schley variety to the extent that good-quality nuts were produced. Unsprayed trees were 93 per cent. severely scabbed.

Bretz (T. W.). **Oak wilt.**—*J. For.*, 49, 3, pp. 169–171, 1 fig., 1 map, 1951.

An account, based largely on the literature of the subject, is given of oak wilt (*Chalara quercina*) [*R.A.M.*, 24, p. 79; 30, p. 494 and next abstracts], the chief points dealt with being its distribution in the United States, host range (13 species found naturally infected in the field and 14 additional species infected by inoculation), symptoms, cause, spread, and economic importance.

Bretz (T. W.). **A preliminary report on the perithecial stage of Chalara quercina Henry.**—*Plant Dis. Reptr*, 35, 7, pp. 298–299, 1 fig., 1951.

Investigations were carried out on the perithecial stage of *Chalara quercina* [see preceding and next abstracts] at the U.S. Department of Agriculture in co-operation with the Missouri Agricultural Experiment Station. The perfect state is described briefly, but not yet named, the perithecia having been obtained by pairing isolates on chestnut agar. Single ascospore cultures have produced characteristic *C. quercina* endoconidia.

Rex (E. G.). **Oak wilt.**—Abs. in *Phytopathology*, 41, 7, p. 659, 1951.

Chalara quercina [see preceding abstracts] readily spreads from diseased to neighbouring healthy oaks of the same species through root grafts. This mode of secondary spread can be reduced or prevented by the prompt severance of root connexions or by chemical injection of the diseased tree so as to clean the affected roots.

Pomerleau (R.). **Rapport général des travaux effectués sur la maladie hollandaise de l'Orme dans la Province de Québec en 1949.** [General report on the work done on Dutch Elm disease in the Province of Quebec in 1949.]—38 pp., 1 pl., 3 graphs, 7 maps, Quebec, Service Forestier, Ministère des Terres et Forêts, [? 1951. Mimeographed.]

In this report [cf. *R.A.M.*, 29, p. 542] it is stated that attempts to control Dutch elm disease (*Ceratostomella ulmi*) in the Province of Quebec [ibid., 30, p. 4] not having met with success, it was concluded that new methods of approach to the problem must be sought. During 1949, therefore, inspection and sampling were on a reduced scale. *C. ulmi* was present in 695 of 1,313 trees sampled; it was not present in any of 364 samples from Ontario [ibid., 30, p. 17], where no further infection has been found. The number of diseased trees did not appear to have declined much and in many localities it had markedly increased. The only extensions of importance were in the counties of Stanstead and Missisquoi as far as the

United States border. Westwards there was an appreciable increase in the counties of Deux-Montagnes and Argenteuil. Since 1944 the disease has been found in 38 counties of Quebec.

Baker (W. L.) & May (C). **Phloem necrosis of Elm.**—*Plants and Gardens* (*Brooklyn bot. Gdn Rec.*), 7, 2, pp. 129–130, 1 fig., 1951.

Phloem necrosis [*R.A.M.*, 29, p. 441] of the American and winged elms (*Ulmus americanae* and *U. alata*, respectively) has now been reported from Alabama and Georgia. The best control of leafhoppers (*Scapnoideus luteolus*) spreading the disease [ibid., 28, p. 256] is by spraying healthy elms with DDT. Two applications, either with a hydraulic sprayer using an emulsion of 1 per cent. DDT, or with a mist blower using 6 per cent. emulsion, should be made in one season, the first in May in the south and in June in the north, the second one to two months later. An emulsion spray is not injurious to elm trees and remains effective a long time.

Schreiner (E. J.). **Breeding Poplars for disease resistance.**—*Plants and Gardens* (*Brooklyn bot. Gdn Rec.*), 7, 2, pp. 140–143, 3 figs., 1951.

Experiments in breeding poplars for disease resistance in Maine plantations have shown that hybrids derived from the Chinese balsam poplar (*Populus maximowiczii*), used as the female parent, were practically immune from leaf rust (*Melampsora*) [*M.* spp.; *R.A.M.*, 25, p. 145; 29, p. 186], whereas in Europe they were highly susceptible. Seedlings from a cross between the eastern cottonwood (*P. deltoides*) and the western cottonwood (*P. trichocarpa*) varied from extremely susceptible to very resistant. The numerous varieties of poplar hybrids provide excellent material for the development of disease-resistant types and are sufficiently fertile to permit continued breeding for increased resistance to all major diseases. Crosses between individual trees growing in widely scattered geographical localities are possible since controlled breeding work can be done on flowering branches in the greenhouse.

Sarasola (A. A.) & Magi (A. O.). **Algunos factores ambientales en correlación con la cancrosis de los Alamos (Mycosphaerella populorum Thomp.).** [Some environmental factors in relation to Poplar canker (*Mycosphaerella populorum* Thomp.).]—*Phyton*, 1, 1, pp. 42–45, 3 graphs, 1951. [English summary.]

Analyses of soil samples from A[rnaldo] M[ussolini] hybrid poplars growing in different parts of the province of Buenos Aires, Argentina, and displaying different degrees of infection by *Mycosphaerella populorum* [*R.A.M.*, 25, p. 16] showed that there was a correlation between disease intensity on the aerial organs and soil pH, the heaviest attacks occurring at 4·5 to 5·5 and little or none above 6·5. Attacks were favoured by rains in spring and early summer. To prevent the disease either poplars should not be planted in very acid soils or excessive soil acidity should be neutralized.

Ciferri (R.). **Malattie crittogamiche del Pioppo in Italia.** [Cryptogamic diseases of Poplar in Italy.]—*Atti Ist. bot. Univ. Pavia*, Ser. 5, 8, 5, pp. 205–229, 8 figs., 2 maps, 1951.

One of the most important diseases of cultivated poplar in Italy is canker (*Dothichiza populea*) [*R.A.M.*, 19, p. 68; 26, p. 431]; it is widespread and usually serious in the north, serious here and there in central Italy, and less common and less harmful in southern and insular Italy. The fungus can attack poplar trees only through wounds. All the chief European and American species appear to be susceptible, though to very different degrees [cf. ibid., 30, p. 293]. In the southern part of central Italy red canker due to various species of *Nectria* appears to be prevalent. In Tuscany the author has observed *N. cinnabarina* [cf. ibid., 13, p.

732], in both the ascigerous and the conidial states [cf. ibid., 14, p. 478; 19, p. 617]. If *N. ditissima* [cf. ibid., 13, p. 732; 23, p. 48] is to be segregated into two species that on poplar should be regarded as *N. coccinea* [cf. loc. cit. and ibid., 18, p. 68]. These *Nectria* species appear to be even more hemiparasitic than *D. populea*. When inoculated into healthy plants they produce only local infection, while in sickly trees or tissues injured by cold or deep wounds a canker may develop slowly. Filamentous canker, caused by *Valsa sordida* [ibid., 30, p. 293] and *V. ambiens* [cf. ibid., 24, p. 476], attacks wounded or weakened trees. Wood rot due to *Stereum purpureum* [cf. ibid., 29, p. 422] has been reported from Piedmont. *Polyporus sulphureus* [cf. ibid., 3, p. 244], *Fomes igniarius* [cf. ibid., 28, p. 439], and *Ganoderma applanatum* have also been observed on poplar by the author, the first-named frequently, the last once. At the edges of old cankers *Schizophyllum alneum* [*S. commune*] is sometimes present. In Lombardy *Lenzites sepiaria* and two species of *Pleurotus*, one closely resembling *P. ostreatus*, have been found on poplar. Bacterial canker [ibid., 29, p. 482] is widespread in the Po valley, affecting up to 100 per cent. of the cultivated poplars in some plantations. The planting of resistant clones, such as I 214, I 154, and I 455, is reducing loss from this disease. It is thought that poplar 'leprosy' [ibid., 27, p. 394] may possibly prove to be a form of bacterial canker. Spring defoliation caused by *Venturia populina* [ibid., 18, p. 639] on black poplar [*Populus nigra*] and the complex of European and American poplars and by *V. tremulae* [ibid., 19, p. 387] on aspen, white poplar [*P. alba*], and a few other species is the most serious disease of poplar in those parts where it occurs [ibid., 17, p. 780]. A resistant female clone, I 154, was obtained from a rustic type of Canadian poplar with a rough grey bark; others are I 214, I 445, and I 37. Other leaf and shoot diseases recorded in Italy are briefly noted, and the paper concludes with a short account of fungal and bacterial maladies attacking nursery seedlings.

Bakshi (B. K.). **Mortality of Casuarina equisetifolia Forst.**—*Indian For.*, 77, 4, pp. 269–276, 2 pl., 1951.

Studies based on observations made during a survey in June and July, 1950, of the *Casuarina equisetifolia* plantations in the Sriharikota island range and the Padugais of Caveri, both in Madras State, and the Balukhand range in Orissa State indicated that failure of the trees was due to deficiencies of water and nutrients. In the Sriharikota range some of the weakened trees were attacked by the wound parasite *Trichosporium vesiculosum* [*R.A.M.*, 29, p. 391 and next abstract]; in coastal plantations, where the thrifty condition of the trees was probably due to atmospheric humidity, infection was secondary but induced rapid wilt.

A detailed study of the incidence of *T. vesiculosum* in a 1944 plantation in Lalapet showed that of 931 standing trees 404 dead or dying ones had no evidence of the fungus under the bark, while 44 dead or dying bore spores of the fungus. Once infection has become established the fungus travels up the stem and down into the roots, where it occurs chiefly in the laterals, both at the proximal and distal ends. Subsequent spread is through the soil, possibly by root contact and root grafting. Dead roots may serve as footholds of attack. Spores were seen in the soil close to infected roots and may be washed down to the roots of healthy trees, which they infect. Hyphae were uncommon in the soil, in which the fungus has only a limited capacity of free mycelial spread.

In the Balukhand range *T. vesiculosum* was not found even in the worst areas, but fruit bodies of *Ganoderma lucidum* [cf. ibid., 29, p. 591] were present at the bases of some mature trees, the fungus parasitizing the roots and hastening the death of trees already weakened by drought.

Control of both fungi consists in raising the vigour of the stands by manuring in pits before transplanting, deep planting, and watering in the initial stages.

T. vesiculosum may be controlled by the avoidance of pruning, by preventing illicit lopping of the branches, and by improved field sanitation.

GUPTA (R. S.). **The soils of the Casuarina plantations with special reference to the causes of casualties (wholesale and in patches) in some of the areas.**—*Indian For.*, 77, 8, pp. 479–499, 3 pl., 2 diags., 1951.

A full account is presented of a study made of the relationship between the growth of *Casuarina equisetifolia* and (1) the incidence and existence of *Trichosporium vesiculosum* [see preceding abstract] from a soil point of view, and (2) the pH value of different layers of soil in relation to healthy growth and casualties, with special reference to *T. vesiculosum*, the data being obtained during a tour made in June and July, 1950, of the Sriharikota island plantation, the Padugai plantations in Madras, and the Balukhand (Puri) plantations in Orissa [loc. cit.]. No correlation was established between attack by the fungus and such field soil conditions as pH, texture, or moisture content, but work is still in progress and no definite conclusions can yet be drawn.

BULL (R. A.). **A new gall disease of Sequoia sempervirens.**—*Gdnrs' Chron.*, Ser. 3, 130, 3376, pp. 110–111, 3 figs., 1951.

An isolated *Sequoia sempervirens* tree growing in Hampden Park, Eastbourne, developed galls on several branches [cf. *R.A.M.*, 2, p. 95]. All appeared to have formed at nodes, and they varied in size from swellings about 1 cm. in diameter to structures 15 cm. across; the largest measured 35 by 22·5 cm. The bark of very young galls was orange or pale brown. On one side of the base of the tree severe galling had completely defoliated and killed the branches. On all parts the leaves were dying back from their tips and fruiting bodies of a fungus were abundantly present on their abaxial sides. The organism appeared to be an active 'needle case' fungus. Another *S. sempervirens* tree about 150 yards from the galled tree showed marked needle die-back but no galls.

The leaves on branches arising in or near a gall were often darker green, abnormally large, almost lanceolate, and the tips tended to curl down. The cause of the disease has not yet been ascertained, although bacterial colonies were constantly secured when surface sterilized or bark-free galls were macerated and plated on nutrient agar. Inoculation tests are in progress [cf. ibid., 22, p. 159].

HAMILTON (J. R.) & JACKSON (L. W. R.). **Treatment of Shortleaf Pine and Loblolly Pine seed with fungicidal dusts.**—*Plant Dis. Reptr*, 35, 6, pp. 274–276, 1951. [Multilithed.]

The effect of three dosage levels (1, 0·25, and 0·0625 per cent. of the seed weight) of arasan, barbak C, new improved ceresan and N.I. ceresan jr, fermate, phygon, puratized 641, yellow cuprocide, and mercuric chloride on the germination of stratified and unstratified shortleaf and loblolly pine seed [*Pinus echinata* and *P. taeda*, respectively] was studied at the Georgia Agricultural Experiment Station, Athens. In the unstratified series the number of treatments out of 16 where increased emergence in both species resulted were 4, 8, and 7 for the three dosages, respectively. In the stratified series the corresponding numbers were 9, 11, and 14. From the results it appears that nearly all the dusts can be used at the lower dosages for the reduction of damping-off [*R.A.M.*, 28, p. 7] in pine seed.

BOYCE (J. S.). **Lophodermium pinastri and needle browning of southern Pines.**—*J. For.*, 49, 1, pp. 20–24, 1951.

In the spring of 1949 pine 'needle browning' (sudden dying-back and browning) was commonly present on loblolly (*Pinus taeda*), slash (*P. caribaea*), and pond (*P. rigida serotina*) pines in the coastal plains of northern Florida, Georgia, and

South Carolina. *Hypoderma lethale* [*R.A.M.*, 20, p. 614; 29, p. 589] was present alone on pond and slash pine needles and, to a less extent, on loblolly, while *Lophodermium pinastri* [ibid., 29, p. 130; 30, pp. 130, 439] occupied most of the loblolly needle tips, together with *Scirrhia acicola* [ibid., 30, p. 131]. In the autumn of 1949 a die-back of the current needles of loblolly pines was prevalent in the Piedmont section of North Carolina, in the coastal plains of South Carolina, and in north-eastern Georgia. Fructifications of *S. acicola* and *L. pinastri* were present on many affected needles. *H. lethale* was again found on the diseased foliage of slash pines in central and southern Georgia in the early spring of 1950.

A study was made of *L. pinastri* particularly as found in the Duke Forest at Durham, North Carolina. The fungus was collected there on the foliage of planted longleaf (*P. palustris*), slash, red (*P. resinosa*), and eastern white (*P. strobus*) pines and in natural stands of loblolly and shortleaf (*P. echinata*). Mature hysterothecia may be present at all seasons on dead needles or dead parts of living needles; in 1949 they were most numerous in summer, at which period the greatest number of airborne ascospores was trapped. In water drops on glass slides the ascospores germinated over a wide temperature range, the optimum being between 20° and 30° C. At 22·5° it was greatest in relative humidities near to 100 per cent.

Various inoculation attempts with ascospores were unsuccessful, indicating that *L. pinastri* is probably not pathogenic to pines in the south-eastern region of the United States, but readily invades needles attacked by other organisms or in a weakened condition.

Müller (E.). **Eine Knospenkrankheit der Stechfichte.** [A bud disease of the prickly Spruce.]—*Schweiz. Beitr. Dendrol.*, *1950*, 2, pp. 69–72, 4 figs., 1950.

In the summer of 1949 the author observed in an extensive planting of Colorado spruce (*Picea pungens* var. *glauca*) in Switzerland an outbreak of the bud blight caused by *Cucurbitaria piceae* [*R.A.M.*, 17, p. 493]. Infection is followed by a marked swelling of the buds, often accompanied by helicoid twisting. New growth is mostly suppressed altogether and the buds die; any shoots that may develop are thin with short needles, tending to perish prematurely. Poor development and irregular growth lend a stunted aspect to the trees. The disease seems to make slow progress, several years elapsing between infection and the appearance of definite symptoms.

The scanty particulars of the fungus available in the literature are amplified. The bud is covered with a black stroma, in which arise the densely aggregated perithecia, perforated at the apex by a pore 30 to 50 μ in width. The oblong-cylindrical asci, surrounded by a paraphysoid network of elongated, hyaline, later brownish cells, measure 180 to 250 by 25 to 30 μ. The broadly fusiform, yellow to brownish ascospores, furnished with five to eight transverse septa and mostly with one longitudinal septum, measure 36 to 50 by 13 to 15 μ. A pycnidial state, characterized by filiform, multiseptate spores and presumably connected with *C. piceae* (*Öst. Gartenz.*, 13, pp. 147–148, 1918), was also observed.

The damage caused by the bud blight is appreciable. In the initial stages control by means of excision and burning of the diseased twigs may be feasible, but when the entire tree is involved the suppression of the perennating mycelium is likely to prove impracticable.

Dwyer (W. W.). **Fomes annosus on Eastern Redcedar in two Piedmont forests.**—*J. For.*, 49, 4, pp. 259–262, 2 figs., 1951.

An investigation of the occurrence of *Fomes annosus* on red cedar (*Juniperus virginiana*) [*R.A.M.*, 22, p. 282; 29, p. 589] in two Piedmont areas, the Duke Forest, North Carolina, and the Calhoun Experimental Forest, South Carolina, showed that trees under 1 in. in diameter largely escaped fatal infection. The

average diameter of all affected trees was 4 in. The disease tended to attack red cedar chiefly in pine forest of different types [cf. ibid., 30, p. 440], but it occurred on this host in hardwood forests also. It was commonly found on dead pine roots and stumps. More infected trees were seen on eroded and gullied pine slopes than in any other situation. Certain soils from basic rocks appeared to support a lower incidence of *F. annosus* than soils from acid rocks. The fungus fruited on 15 per cent. of infected cedars in Calhoun Forest. Root-to-root transmission and conidial sporulation on litter are other possible means of spread. In red cedar only the sapwood is invaded, the heartwood containing a principle toxic to the fungus. Red cedar approaching post and pole size in the Piedmont region can be expected to sustain losses of over 10 per cent. of the trees.

Sawada (K.). **Fungi inhabiting on conifers in the Tōhoku district. II. Fungi on various conifers except 'Sugi'.**—*Rep. For. Exp. Sta., Tokyo*, 46, pp. 111–150, 4 pl., 1950. [Japanese.]

Japanese and Latin diagnoses are presented of 58 new species of fungi and descriptions of 30 others, all on the leaves and stems of the conifers in the Tōhoku district of Japan. It is not apparent from the Latin diagnoses which of the species are actively parasitic.

Nixon (H. L.) & Watson (M[arion] A.). **Beet yellows virus.**—*Nature, Lond.*, 168, 4273, pp. 523–524, 1951.

Experimental evidence obtained by the writers at Rothamsted Experiment Station suggests that sap from beets affected by yellows virus [*R.A.M.*, 30, p. 306] contains at least two kinds of specific particles, the rod seen in electron micrographs, and another, of unknown shape and size, but probably occurring in much higher concentration. The character of the precipitin reaction suggests that this particle may be spherical. The relationship between the components has not yet been ascertained. The rods may perhaps be an alternative form of the spherical particles or the two components may be quite distinct, one being the infective particle and the other a product of the disease.

Verordnung des Bundesministeriums für Land- und Forstwirtschaft vom 5. Oktober 1949 über Ein- und Durchfuhrbeschränkungen zur Verhütung der Einschleppung gefährlicher Pflanzenkrankheiten und Pflanzenschädlinge. [Ordinance of the Federal Ministry of Agriculture and Forestry of 5th October, 1949, concerning import and transit restrictions for the prevention of the introduction of dangerous plant diseases and plant pests.]—*PflSch. Ber., Wien*, 4, 7–8, pp. 117–122, 1950.

The following are among the provisions of the above-mentioned Ordinance [cf. *R.A.M.*, 14, p. 543; 28, p. 144]. The importation into Austria is prohibited of rooted carnations, carnation cuttings, and (within the period from 15th March to 30th November) cut carnation flowers; plants of *Abies*, spruce, pine, *Pseudotsuga*, *Tsuga*, elm, and poplar, together with cuttings, slips, scions, and other corticated portions thereof; shoots, leaves, and roots of tomato, potato, and eggplant; and beet and mangold plants, except the seeds and trimmed roots. Potatoes (without soil) may be imported provided they are free from wart disease (*Synchytrium endobioticum*), which must further have been absent over a radius of 5 km. from the site of cultivation for at least five years, and are packed in unused sacks with a certificate of freedom from virus diseases (except mild mosaic [potato virus X]). Peach trees or scions and strawberry plants may be imported only without soil and accompanied by certificates of freedom from peach and strawberry viruses, respectively. Flower bulbs and corms entering the country must be free from soil and from infection by *Pseudomonas* [*Xanthomonas*] *hyacinthi*, *Sclerotinia bulborum*, *Sclerotium tuliparum*, and *Botrytis tulipae*.

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